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THE

VETERINARY JOURNAL.

EDITED BY

PRINCIPAL W. OWEN WILLIAMS, F.R.C.V.S., F.R.S.E.

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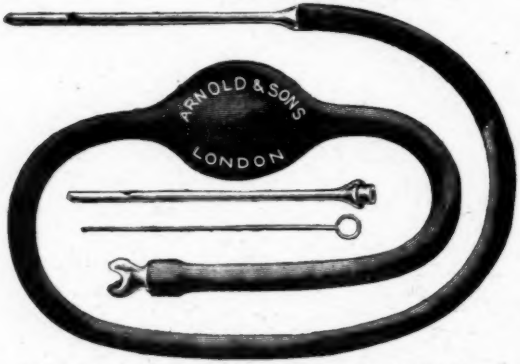

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JANUARY 1901.

Editorial.

MUST WE LOWER OUR FLAG?

PROFESSOR M'FADYEAN is a man of very subtle intellect, so subtle, indeed, that the ordinary man can only gape with astonishment at his refinements. It is a pity that he is only a veterinary professor: as a theologian he would have been a brilliant success; as a Jesuit Father he would have been a match for Pascal himself. He is so filled with dialectic enthusiasm that he actually begged permission from the Midland Counties Veterinary Medical Association to read a paper at their meeting of 15th November last on the general—that is, preliminary—education of the veterinary surgeon. This is a subject in which, as representing the teaching department of the profession, we are vastly interested, and we read the report of Professor M'Fadyean's paper and the debate thereon with the very keenest interest, hoping to gather much wisdom and a little consolation. Shall we confess to disappointment? Is it our own density, or is it the dazzling brilliance of the Professor's logic that leaves us in a state of pure bewilderment? Professor M'Fadyean says, "The question of the welfare of the schools has absolutely no place here." This was our first blow, and it was a severe one; may we say it completely staggered us? Then he goes on to say, "Although the school with which I have the honour to be connected has suffered financially in consequence of the adoption of a higher standard of examination in general knowledge, I recognise the fatuity of urging this as a reason why the standard should be lowered. Similarly I recognise that it would be no valid argument against adopting a still higher standard to foretell the consequent ruin of the schools." Surely Professor M'Fadyean doth protest too much. Self-denial is an excellent thing in its way, but no one expects teachers to throw themselves before the car of Juggernaut in this startling way; we, for our part, distinctly refuse to do so, and that not merely on selfish grounds. The schools *must* be taken into consideration; they are the portals through which young men must pass in order to enter the profession. It would be as sane to say, "I care not for the boyhood of mankind. I want the perfect man"—as if a human being could leap from infancy to manhood, as if every youthful influence were not traceable in the man. This is so obvious a truism that we pass from it to other

matters, merely remarking that the whole of Professor M'Fadyean's paper really hinged upon the question of who is to be admitted to the schools in order to qualify for a veterinary career, and the whole of the subsequent discussion was devoted, more or less diffusely, to the same subject.

Professor M'Fadyean is tragically severe in his impeachment of the nine criminals who proposed to uphold the traditions—the later traditions, so to speak—of the profession. He thanks Heaven that there are still courts of justice in the land for the protection of innocent youth when assailed by monsters like ourselves. In this the learned Professor is perhaps a trifle theatrical. Let us admit that Professor Dewar was somewhat irregular in framing his motion, and perhaps did not foresee all that it implied. Does any one think that he proposed to do what was illegal? Would Mr. Thatcher's warnings have been neglected when the matter came to be viewed more closely, and his legal skill had pointed out the irregularity? Would any sane man deliberately propose not only to stultify the action of the Royal College, but to break a solemn engagement with intending graduates? The plain truth of the case is this: the Scottish Colleges, in their zeal for the honour of the veterinary profession, have been striving to keep up to the high-water mark of the medical in respect of preliminary examinations, and in this respect it seems to our benighted ignorance that they have followed not only a lofty but an intelligible purpose. The General Medical Council knows its own mind, and keeps its objects steadily in view. It decides at its meetings what examinations are to be accepted and what are not, and it lays down pretty severe regulations so as to ensure that it will get what it wants. We are uncertain in our aims and vague in our regulations. It is a little ridiculous to say that we want an examination which would have admitted a candidate to the medical schools in 1896; these pluperfect subjunctives are uncanny things and difficult to handle, they often say one thing and mean another. A more rational course, if we definitively abandon the medical lead, would be to instruct examining bodies to provide us with a special examination on a lower plane than the medical,—if, of course, we can get them to provide us with such,—and frankly admit to the world that our wings are too weak to follow the higher flight of our medical brethren.

It appears that we in Scotland have been too ambitious, too jealous of the honour of our profession. We hoped to rouse our English brethren to higher things, to make them shake off the lethargy which is slowly creeping over them, and perhaps our assault was a little rude, at any rate "the predominant partner" has resented our action and misconstrued our meaning. It is now obviously impossible to resist the subduing influence any longer. In spite of Professor M'Fadyean's heroic declamation, we can see quite clearly that his object is to protect the school with which he is connected; to lower, if we may borrow a phrase from commercial

life, the import duty at the Port of London. This is all natural enough, if the learned casuist would only admit it, and not seek to cover it with a rhetorical veil, and it is perhaps inevitable. We cannot enter upon a war of tariffs,—our treasury would not admit of it,—and our only course is now to accept the lower examination offered to us by the College of Preceptors, but we do it regretfully. Let no man say of us in the future that we have not striven after higher things.

A NEW DEPARTURE IN LEGAL PRACTICE.

IN another column we print a report of a case which was tried before Judge Steavenson at Carlisle on 5th December. Many points of interest emerged in the course of the trial, and these will furnish food for reflection and speculation of various kinds, painful and otherwise, to our readers. It seems a pity that scientific men should differ so widely on points on which there might conceivably be unanimity. Diagnosis of disease is, it is true, essentially a delicate and difficult matter, and into it a certain element of doubt must necessarily enter. Our patients have the great disadvantage of not being able to help us by speech, as human patients help their advisers, and we must therefore trust more to touch and sound than medical men do. It has further to be conceded that the phenomena and symptoms of disease are frequently misleading, the same symptoms accompanying different diseases, and different symptoms characterising the same disease, in accordance with the constitution and temperament of the patient. It must also be kept in mind that skilled witnesses are expected to make *ex parte* statements,—in other words, to emphasise only one side of the case, that on which they are engaged, and to minimise to the utmost extent, —if possible, to ignore utterly—all facts which strengthen the case of their opponents. We think it was Dr. Johnson who was once taken to task by a friend for arguing in favour of some theory which he had bitterly opposed a few days before. The learned Doctor was not at all disconcerted. He amazed his conscientious friend by telling him that it is as easy to take the one side of a dispute as the other, especially if you choose to employ sophistical arguments, and wish to show your skill in handling them. Absolute truth is very difficult of attainment ; it has many sides, and they all differ ; no part of the truth can, of course, be the whole truth, and no combination of parts unless the whole number be taken ; and it is difficult to say when we have grasped the whole of these parts, as we cannot tell how many there are. Only by conflict of opinion can truth be evolved. It is, therefore, a salutary process to call forth the full strength of your opponent's argument by vigorously stating your own, and leaving the result to take care of itself ; that result will probably be a modification of opinion on both sides, a more or less clarified portion of truth at the least. Now a judge on the Bench may be expected to act as the silversmith who frees

the silver of truth from all dross and presents the pure metal to the world. A judge ought, we humbly think, to have less difficulty in evolving the pure truth from the conflicting, or apparently conflicting, statements of medical or veterinary men, because after all we all use the same methods, and because an earnest desire for truth is the essential equipment of the man who would investigate the workings of nature, No man can hope to enter the sacred inner courts of scientific knowledge until he has purified himself of all vain ambition and all wicked disregard for truth, in the outer vestibule of the temple.

Having said so much, we must, with all due deference to one of Her Majesty's Judges, express our extreme astonishment—we might almost say consternation—at the unusual course adopted by Judge Steavenson. His Lordship heard all the evidence given by the witnesses, expert and otherwise, and then, as if in hopeless bewilderment, he expressed his determination to see the horse which formed the subject of dispute with his own eyes and examine him with his own hands. The disease from which the animal was said to be suffering was stringhalt, and his Lordship was so good as to explain to the admiring and astonished court that this was a disease with which he was himself acquainted. A judge who can diagnose stringhalt is no common man, and we hope that Her Majesty will keep this in mind when there is promotion going. But a judge who can decide as to whether a horse has or has not stringhalt, when some half-dozen of the most skilful veterinarians in the country cannot agree upon it, is a perfect Daniel, and we confidently expect to see Judge Steavenson sitting one of these days on the Woolsack. It will further be noted in passing that his Lordship, in spite of his great learning and profound skill, is a modest man. "He did not think he could learn more than such a number of professional men would have learned, but he thought he might have learned a little as to the facts." We trust it is not irreverent to ask if the learned judge remembers what Pope says about a little learning being a dangerous thing.

We confess, after this experience, to a feeling of terror and apprehension as to our chance of being able to make our bread and butter in the future. If our judges are to step down from the Bench, and, bidding us stand aside, tell us they know, although confessedly laymen in such matters, far more about our business than we do ourselves, what is to become of the poor veterinary profession? Of course, as a set-off to this terror, if Judge Stevenson's practice is to become the rule, then all aspiring barristers who hope to arrive at the full glory of a Lord Chancellor will have to take a course of veterinary medicine, and we may hope in our declining days to be employed, as mere drudges of course, in teaching them the elements of that science, leaving them to sublimate it at their leisure, but this is a very faint hope indeed. Perhaps, also, the young lawyers may prefer empiric—we mean, of course, intuitional—methods, and despise our wretched help. But

horrors accumulate: will it suffice for barristers and judges to have a knowledge of veterinary science alone? Why should it not be necessary to add to their intellectual equipment a knowledge, say, of medicine as applied to the human patient, engineering, architecture, shipbuilding, mining, farming, &c. &c. &c., and if not, why not, we say? Disputes occur in all these arts, and opinions are hopelessly divided. What a chance for an omniscient judge! For, let it be noted, nobody can cross-question him; he gives his opinion, and it is final. The stupid public will of course fail to see the advantage of omniscience; they will object to seeing their cases settled off-hand by one who combines in his person the triple qualification of judge, advocate, and witness; they will fail to see the economy of time and labour involved in the new procedure, but, then, the most of men are so stupid.

Royal College of Veterinary Surgeons.

DECEMBER EXAMINATIONS IN LONDON.

A MEETING of the Board of Examiners was held in London on December 14th for the Written, and on and between the 17th and 19th inclusive for the Oral and Practical Examinations.

The following gentlemen passed their *Final Examination*, and were admitted Members of the Royal College of Veterinary Surgeons, subject to their complying with the further requirements of the College:—Messrs. H. Burrell, E. Child, E. Finucane, D. G. W. Galt, C. G. Hearn, J. W. Flanagan, E. Nicholson, T. Parker, R. H. Pinching, W. N. Rowston, H. E. Whitemore,* E. A. Wilshaw, E. J. Wadley,* and C. W. Wilson.*

The following passed their *Third Examination*:—Messrs. A. A Donnelly, A. Edgar, W. G. Flanagan, T. Haigh, R. E. Klyne, P. J. H. Kelland, A. C. Lloyd, R. Morford, J. R. Steevenson, and G. H. Ward.

The following passed their *Second Examination*:—Messrs. T. F. Hancock, W. L. Little, T. Love, H. Newton, F. D. Neal, A. V. W. Sewell, A. J. Thomson,* and W. F. Wilson.

The following passed their *First Examination*:—Messrs. A. C. Anderson, S. G. Balls, P. J. Bolton, W. T. Christie, H. C. Dibben, T. A. Nicholas,* G. O. Ogden,* H. K. Roberts, J. Richardson, and H. Sproston.

ARTHUR WM. HILL,
Secretary.

NEW VETERINARY COLLEGE, EDINBURGH.

Final.—James Stafford, Carlisle.

Third (3 *years*).—Theoretical Portion—A. Scotson.

Do. (4 *years*).—Messrs. R. Finch, A. Mattinson, F. Moon, Z. B. Rutherford, and H. Sanderson.

Second.—Messrs. R. Mairs, J. A. Shaw, J. C. Smith, A. Walker,* and G. Nicholson.*

First.—Messrs. J. Aitken, H. Barr, J. Fearnside, E. Nicholson, K. P. Ranken, A. Whitehead, and J. O'Leary.

Marked * thus passed with Second Class Honours.

THE NATIONAL VETERINARY BENEVOLENT AND MUTUAL DEFENCE SOCIETY.

THE Annual Meeting was held at the Grand Hotel, Aytoun Street, Manchester, on Thursday, December 6th, 1900. George Morgan, Esquire, President, in the chair.

PRESIDENT'S ADDRESS.

Gentlemen,—It is customary in most well-regulated businesses to take stock once a year—to ascertain, if possible, how things stand—to learn lessons from the past, and scheme for success in the future. That is our mission here to-day. We are not only at the close of another year of the Society's existence, but near to the close of the century that gave us birth. And we may be excused should we pause, and as from an eminence survey the course we have steered since the start, a retrospect that may not always be pleasant, yet nevertheless one from which we may learn a lesson for the future.

Along the road we have travelled during the last thirty-five years we discern many places where our fellow-workers have fallen out from the ranks, and left us to carry forward the banner of Veterinary Defence and Charity. All did good work in their day and generation, yet some were more prominent than others. Need I say they bear the names of Lawson, Greaves, and Taylor. They have closed their account, but the good work they did we should not forget, but endeavour to keep their memory green, in order to stir up the spirit of emulation in the younger members of the Society.

Only recently another leader has fallen. One who was not only present at the inception of the Society, but has all along been a faithful member of Council, ever ready to give not only his wise counsel, but his valuable personal assistance to professional brethren in distress. Need I say that I allude to Professor Williams, whose death we all sincerely deplore, and express our deepest sympathy with the bereaved family.

To me, personally, he was one of my oldest friends, our acquaintance dating from the time we met in Clyde Street, when both were struggling to learn the rudiments of the profession which he has so much adorned and elevated. He, too, is gone to that bourne from whence no traveller returns, but the good work he has done in his lifetime will bear fruit for generations yet to come, for—

"Tell me not in mournful numbers,
Life is but an idle dream.
* * *
Life is real, life is earnest,
And the grave is not its goal;
Dust thou art, to dust returnest,
Was not spoken of the soul."

With regard to the Society and its workings during the past year, it is my pleasing duty to congratulate the members on its continued success. All cases brought under the notice of the executive officers have been dealt with in such a punctual and practical manner as to merit the full confidence of the members. The number of members has increased, but not in the same ratio as one would have expected, seeing the great benefits one derives from becoming a member.

The wonder to me is that every member of the profession in practice

does not send entrance fee and year's subscription to the Secretary at once, and thus ease his mind from threatened assaults of cross-grained clients, or the shadow of distress which might suddenly fall on his widow or orphans by untimely death, either from accident or disease.

The Secretary and Treasurer in their reports will tell you the particulars of last year's working, which you will find satisfactory.

Now that this Society has firmly established itself, we must look forward to its advancement. There must be no standing still. Some years ago I hinted at what I considered the proper thing to do,—that is, federation with the whole of the Veterinary Medical Societies in the country, giving them representatives on the Council, and using their officers to make the necessary inquiries in their several districts. Such a scheme is well worth the consideration of the younger members of the profession, and my earnest hope is that some one will work it out.

As for myself, having now passed the allotted span, it is my wish to retire from the proud position of President in which you placed me, and to thank you all for the cordial support you have given me while in that position, and the many kindnesses received during my long connection with the Society, for—

> "Whether we smile or weep,
> Time wings its flight;
> Days, hours, they never creep—
> Life speeds like light."

Secretary's Report.

Mr. President and Gentlemen,—In submitting my annual report, I have pleasure in speaking of the continued usefulness of the Society. Your Council have met twice during the year to deliberate on several cases, but a good deal of work has been done by the executive officers, the President thinking it advisable to call as few meetings as possible, to avoid putting members of Council to much inconvenience and expense, especially those who reside some distance away. We have only had one case of defence; the Council, after hearing the evidence as produced by the defendant, resolved to defend the case. During the course of the proceedings, however, it was found that we had a very weak case, and, acting under advice, we settled the matter out of Court, costing the Society £40 : 0 : 4. This amount would have been considerably increased but for the kindness and generosity of George Thatcher, Esq., the solicitor to the R.C V.S., whom we had engaged to defend the case. He would not make a charge (out-of-pocket expenses only), and also offered his services on any future occasion free of cost. I have also to acknowledge the kindness of Morton Smith, Esq., the legal adviser to the Council (London); he also would make no charge. The best thanks of the Society are due to these gentlemen.

With respect to the benevolent branch, your Council have paid further grants—£40 to Mrs. A. L. G., widow of a late member; £3 to Mrs. K. C., widow of a non-member; £2 to Mrs. D., wife of a non-member; and £5 : 5s. to Mrs. H., widow of a non-member.

The membership of the Society continues to increase. During the last year fifteen new members were enrolled, deaths and resignations five, the total strength being 232, a very fair membership, but nothing like what it ought to be considering the number in the profession, and the great benefits the Society bestows upon its members, and in fact to all those who require assistance who are in any way connected with the profession.

I cannot close the report without referring with the deepest sorrow to the untimely death of our old friend and member of Council Professor W. Williams, who took such an active and sympathetic interest in all that appertained to the welfare of the Society. We all mourn his loss, but have the consolation of knowing that his works will long live after him.

The TREASURER, in presenting his report and balance-sheet to date, said the accounts would be audited at the end of the year, and a copy of the balance-sheet forwarded to each member.

Letters were read from Mr. R. Scott, acting for the students of the New Veterinary College, Edinburgh, mooting the question of establishing some memorial to the memory of the late Professor William Williams. It was moved and resolved, "That this Society is in sympathy with the desire to perpetuate the memory of the late Professor Williams, and appoint the Council to act as they deem best in any well-devised scheme that may be brought forward for that purpose."

Mr. J. E. SCRIVEN then moved the following motion, due notice of which had been given :—"That in future the Treasurer be empowered to pay from the defence fund all railway fares and other necessary expenses incurred by member of Council attending meetings of Council or acting on investigation committees."

After a full discussion on the motion, and securing the feeling of the majority of the members, Mr. Scriven asked leave to withdraw it, which was granted.

ELECTION OF OFFICERS.

The following officers were appointed for the year 1901 :—*President*—Geo. Morgan, F.R.C.V.S., Liverpool. *Vice-President*—W. A. Taylor, F.R.C.V.S., Manchester. *Treasurer*—E. Faulkner, M.R.C.V.S., Manchester. *Hon. Sec.*—Sam. Locke, M.R.C.V.S., Manchester. *Council*—J. Abson, F.R.C.V.S., Sheffield; A. L. Butters, M.R.C.V.S., London; J. S. Carter, F.R.C.V.S., Bradford; T. Hopkin, F.R.C.V.S., Manchester; A. Lawson, M.R.C.V.S., Manchester; A. W. Mason, F.R.C.V.S., Leeds; R. S. Reynolds, M.R.C.V.S., Liverpool; J. E. Scriven, M.R.C.V.S., Tadcaster; R. C. Trigger, F.R.C.V.S., Newcastle-under-Lyme; J. B. Wolstenholme, F.R.C.V.S., Manchester; W. Woods, F.R.C.V.S., Wigan; J. E. Kitchen, M.R.C.V.S., London. *Auditors*—Messrs. Butcher, Litton, Pownall, and J. B. Wolstenholme.

The TREASURER brought forward the subject of arrears, several members being in arrears three years. It was resolved that these gentlemen be again asked for their subscriptions, intimating that in the event of not paying before the end of the year they would be crossed off the roll of membership.

Mr. FAULKNER proposed, and Mr. MASON seconded, the following motion :—"That the Secretary be instructed to forward, in the name of this Society, a letter of condolence and sympathy to the family of the late Professor W. Williams in their sudden and sad bereavement."

Mr. FAULKNER introduced the subject of "Federation," the advisability of which was suggested by the President, Mr. Morgan, some time ago. He now proposed that the Council take the first opportunity of considering the matter, to endeavour to bring same to a practical issue.

A vote of thanks to the officers for their services in the past year, and to the Chairman, closed the proceedings.

SCOTTISH METROPOLITAN VETERINARY MEDICAL SOCIETY.

A MEETING of the Scottish Metropolitan Veterinary Medical Society was held in Edinburgh on Wednesday, 5th December. Mr. T. M. Inglis, Forfar, President of the Society, occupied the chair.

THE LATE PRINCIPAL WILLIAMS.

The CHAIRMAN said,—"Gentlemen—I have a few remarks to make on a subject which unfortunately is of a sad description. Since our last meeting this Society has sustained a great and irreparable loss, and the veterinary profession has lost by death one of its most prominent members. We all mourn to-day, and can scarcely comprehend, that we have lost our friend Principal Williams. Few, if any, of our profession have had such a brilliant career. Starting as he did, and coming through so many trials, he never failed to aim at promoting the science of the profession he loved so dearly. I am sure I am not going out of my way when I say he was considered the best all-round authority on diseases peculiar to the lower animals. By hard and constant work he earned for himself a reputation which was absolutely unique. As a *teacher* he undoubtedly stood in the front rank of his profession, and had few equals. Those who have the honour to be graduates of the New Veterinary College will always remember his class. He had a force of character and a quality of expression peculiar to him alone. His lectures told, and the style in which they were delivered always had the best possible results, even amongst those who had not the best of memories. His many qualifications as a teacher were soon shown to his class, and drew his students into closer touch with him, and also gave them confidence that he was no ordinary man, but one who knew his many subjects, and that no one was more highly gifted with a general knowledge of the science and art which he taught. Amidst his many duties as a teacher and practitioner he also found time to write two of our standard works, which I am safe to say will be upheld for many years to come as one of the best authorities on Veterinary Medicine and Surgery. As a consultant, where can we find his equal? All who have had experience of him as an expert witness will long remember his style of evidence and the weight it carried. We knew him as our Principal, and, perhaps more intimately, as a member of this Society. He was an interested and interesting member, was keenly anxious in all subjects brought up for discussion, and his absence we feel very much to-day. I understand there is some talk of devising a suitable memorial, but, although this is a step in the right direction, I cannot help expressing the opinion that the late Principal with so unique a reputation requires very little in any form to perpetuate his memory. In conclusion I beg to propose that our Secretary send from this Society a letter of condolence to the family of our late member and friend Principal Williams."

Mr. CAMERON, in seconding the motion, said it did not require a single word to signify their approval to this letter of sympathy to the family of the late Principal. With regard to the proposed memorial, there would, no doubt, be a diversity of opinion as to the manner in which it should be carried out. No one could call in question the fact that the late Principal's characteristics were those of a practitioner and a teacher, but there was another aspect of his life in regard to which something might be done to

perpetuate his memory, namely, that of an investigator. There were many members of their profession who were good practitioners and good teachers, but who had not the capacity for investigating. For many years he had felt it was a drawback in their profession that they had not a sufficient number of members with the capacity to investigate any subject thoroughly. His idea was that they might establish a bursary upon the same lines as the bursary that Miss Dick gave soon after Principal Dick's death. That bursary was only given for two years, the first being awarded to Mr. Spreul and the other to Mr. Hutcheson, who was now in South Africa. No one could deny that, through this bursary letting them spend another year in study, it had certainly enabled them to occupy the leading positions which they held at the present time. A fund for such a purpose could be raised, and it need not be confined to the veterinary profession alone, for the whole agricultural and stock-breeding world were interested in every advance made in the veterinary profession, and were deeply indebted to the late Principal. The question was, would it be possible to raise a fund which would give a sufficient bursary every year to enable the best student of the session to continue a certain time longer at his studies, making a special investigation in some particular department, such as bacteriology. Such a bursary would be a splendid means of commemorating Principal Williams' discoveries and investigations in the animal world. For such a purpose he thought they could unblushingly solicit subscriptions from the whole agricultural world.

Mr. RUTHERFORD said a little meeting like theirs could do nothing in such a large matter by themselves. He thought the writer of the letter from the New Veterinary College was on the right lines. He simply proposed to be one of a number. The way to get up a memorial to Principal Williams or any other leading scientific man, was to call a meeting of the leading members of the profession to which he belonged, in some centre that was easily reached by members of the profession from Scotland, England, and Ireland. There was no use calling a meeting in the hole-and-corner way, that might be attended by only fifteen or twenty gentlemen. They wanted a large meeting of gentlemen interested in this question, if a memorial was to be raised. They must not have a meeting in any particular College, attended perhaps by only those gentlemen who were friendly to the question, but they wanted in this case a thoroughly cosmopolitan meeting. The admirers of the late Principal were here, there, and everywhere. This was the only way they were likely to succeed in getting funds that would establish a handsome memorial, whatever shape it might take. It was rather unfortunate that Mr. Moir was ill, and could not take the initial steps, because he was a great believer in hitting the iron while it was hot. They required to draw upon people's sympathies at a time when their sympathies were warm, and not when they were beginning to cool, because even the best of them would not be missed for very long. It was extraordinary how soon a man was forgotten. It would be a long time before the late Principal would be forgotten by himself, but he could not answer for his brother professionals, and the quicker the movement was taken up the better. If he might venture to say so, it would be a splendid initial work for Mr. Aitken. He suggested that Mr. Aitken should circularise the whole profession and all the different Associations. He had no doubt it would cost money, but he was prepared to subscribe outside the funds of the Society, anything in the way of initial expenses for circulars and advertising.

Original Papers.

MOSQUITOES AND MALARIA.

Dr. Manson delivered a most fascinating lecture on this subject, as the guest of the Junior Scientific Club at Oxford, on Wednesday evening, 28th November. The lecture, which was listened to by a large and deeply interested audience, was full of interesting information. The lecturer began by explaining how the parasite gradually invaded the blood corpuscles, showing by means of diagrams the different forms it assumed as it grew in size and strength. He then illustrated the mode of reproduction by means of tendril-like off-shoots. After this preliminary matter, he gave an historic account of the growth of the theory of the connection between mosquitoes and malaria—Ross' experiments with sparrows, and Grassi's confirmatory experiments on man. He then went on to describe how through the enlightened policy of Mr. Chamberlain funds had been granted for the prosecution of contemporaneous experiments in London and Rome, touching on the foresightedness of a minister who recognised in malaria a much more dangerous enemy than the Boer; for the latter, he remarked, is a passing incident, the mosquitoes will go on till the end of time. Continuing, he described how a mosquito-proof wooden hut had been made in London and sent to the Campagna, where it was set in the most virulent spot, with two English doctors and an artist as tenants. The customary precautions of retiring before sunset were observed, and all unnecessary risk avoided, with the result, that during a long stay not one of the inhabitants suffered any ill effects. The lecturer very amusingly related how dearly the authorities suffered from their system of espionage on the hut; as it was just after King Humbert's death, foreigners were looked on with a jealous eye, and no less than fifteen policemen were sent to supervise. These, after spending a night in the precincts of the hut, all got malaria very badly in course of time as a reward for their officiousness.

Meanwhile, two experiments in London with mosquitoes brought from Italy, which had been fed on malarious blood, proved entirely successful, acute stages of a typical nature ensuing on bites from "lusty" mosquitoes. All this tended to prove conclusively the close relation between insect and disease, in addition to the extraordinary fact that the tertian form of the parasite caused tertian, the quartern form quartern, the malignant form malignant malaria. None of the arguments brought forward against the theory were in any way sufficient to invalidate it.

The proceedings terminated with lantern slide preparations, and the answering of various questions put by members of the audience. Asked in the course of these if he thought that destruction of mosquitoes meant total destruction of malaria, the lecturer replied with an emphatic affirmative.

THE PARIS CONGRESS FOR HYGIENE AND DEMOGRAPHY.

At the Tenth International Congress held recently in Paris a discussion took place on the subject of the codification of regulations to be everywhere observed for meat inspection in public and private slaughter-houses, and in places appointed for the preparation and sale of meat. Professor Barrier, of Alfort, gave in a report as follows:—

"Although a good deal has been done in the way of meat inspection and the building of public slaughter-houses, there is still a great lack of uniformity in organisation. Common regulations must be adopted by all countries for all animals used as food, and all caprice and irregularity must be abolished. Congresses should make it their endeavour to impress such matters on the various Governments. Private abattoirs in thickly populated districts, and especially in the neighbourhood of great cities, constitute a great danger to the public, because in such places all unsound and inferior meat tends to gravitate. Another trouble is want of uniformity in applying regulations; one man applies them loosely, another severely. Only a law making the regulations uniform and obligatory can remedy this. An international agreement on this matter is not impossible, provided it be confined to a small number of essential points. In commercial treaties this ought to be kept in view.

"All regulations must rest upon a scientific basis supported by experience. There are still some diseases without visible phenomena by reason of which flesh food—perhaps in consequence of the presence of toxins—possesses hurtful qualities even when cooked. For this reason empiric knowledge of meat inspection is quite insufficient. Meat inspectors cannot have too wide or too deep an acquaintance with their subject; such acquaintance can be obtained only from veterinary surgeons, and proficiency ought to be tested by special examination.

"Private abattoirs ought to be suppressed and their place taken by public ones, but as many communities are apt to neglect this principle from parsimony, dread of the butcher, or pure indifference, the law should take the matter in hand. It ought to be enacted that every town containing more than 5000 inhabitants must have a public abattoir. For smaller towns and villages private abattoirs might be permitted, but only under strict regulations as to supervision and hours during which meat might be killed. Small communities at a distance of, say, five or six miles from a bigger, ought to be compelled to unite with the latter in erecting a common slaughter-house.

"With regard to the question of one proper person to be entrusted with meat inspection, it must be distinctly stated that veterinary surgeons are the most suitable. Even for them a course of special study at a large abattoir for one year at least is necessary. Many small places could not, of course, pay a veterinary surgeon, and for these a non-professional man might suffice, but to such lay inspectors only very limited power should be entrusted, and in every case they must have been taught by veterinary surgeons in large abattoirs, and must have been specially tested. Veterinarians must always constitute the court of final appeal, and all lay inspectors must be under the control of the nearest veterinary inspector. The latter must be informed of all cases in which the meat does not appear sound. The appointment of lay inspectors is merely an unavoidable necessity, but it is better than nothing at all. They must be instructed in the elements of the anatomy and physiology of the domestic animals, in the phenomena of health and disease, methods of testing flesh, the technique of slaughtering and dismemberment, reasons for condemning carcases and the law relating thereto. To the veterinary surgeon must be reserved the examination of condemned carcases, the inspection of markets, the examination of cattle-pens, the management of slaughter-houses, and the general control of the inspecting service.

"Only stamped meat ought to come into consumption; with regard to imported meat, all carcases of oxen should come in quarters, swine in halves, other animals whole. The more important organs must remain in their natural position. All imported meat ought to be accompanied by a declaration from an official surgeon. All condemned meat must be destroyed or rendered useless, but special public markets might be provided for the sale at lower prices of meat that is not hurtful to health, but yet cannot be allowed into circulation. These special markets must be under rigid sanitary and police control, and only the following kinds of meat may be sold, namely, meat slightly affected with measles, after it has either lain for two or three weeks in salt or hung in the refrigerator for the same time, or has been cooked; also the flesh of well-nourished tuberculous animals; the flesh of animals which have been slaughtered in consequence of accident or of certain diseases, provided that the flesh is not essentially affected; also the flesh of emaciated but otherwise healthy animals."

Professor Barrier recommends a general and obligatory scheme of insurance of domestic animals used for food. He thinks that such a scheme would lead to the diminishing of the so frequently occurring destruction of diseased cattle in places where there is no meat inspector and no public abattoir. This probably means that the insurance company's inspectors would, in the interest of their company, take care that all disease should be stamped out on its first appearance.

M. Morot, director of the public abattoir at Troyes, generally concurred in Professor Barrier's statement. He insisted on a uniform and rigid inspection of abattoirs by properly qualified veterinary surgeons. He thought that private practice in places of more than 15,000 inhabitants ought to be forbidden, and that veterinary inspectors ought to have a properly equipped laboratory at their disposal. Animals intended for slaughter ought to be examined, both alive and dead; in oxen and swine the tongue ought specially to be examined. All abattoirs ought to be provided with refrigerators and sterilising apparatus.

THE GENERAL EDUCATION OF THE VETERINARY STUDENT.[1]

BY PROFESSOR J. M'FADYEAN, R.V. COLL.

MR. PRESIDENT AND GENTLEMEN—I think it is probable that in one point the circumstances under which I have been afforded an opportunity of addressing this Society to-day are peculiar. There are good reasons for believing that the papers which are read at the meetings of this and kindred Veterinary Associations are the outcome of solicitation or even some degree of pressure by the honorary secretary. In this case, however, the solicitation was on my side, since I begged the officers of the Association to grant me the opportunity of bringing certain important matters connected with the general education of the veterinary student before the members at this particular meeting. I was moved to do so because there appeared to me to be great danger of the profession finding itself committed by unwise action on the part of the Council of the Royal College of Veterinary

[1] Read at a Meeting of the Midland Counties Veterinary Medical Association on November 13th.

Surgeons to a position from which it would soon be necessary to find a means of retreat, and because I hoped that by calling the attention of this Society, and through the publication of this day's proceedings the attention of other Societies, to the matters in question the danger to which I refer might be averted. It may, of course, turn out that the course which I have found an opportunity to take will not have the effect which I desire and expect, and that the discussion may serve to indicate that the contemplated action on the part of the Council of the Royal College of Veterinary Surgeons, or at least of certain members of it, is not viewed with disfavour by the majority of the profession. Even in that case, however, I shall not regret having come here on this occasion, and I shall continue to feel grateful to your President and Secretary for having granted me the opportunity that I desired, and equally grateful to the gentleman who for my convenience agreed to postpone the paper which otherwise he would have brought before you to-day.

In order to make the present position of affairs with regard to the question of general education clear, it will, I fear, be necessary to trace the history of the attempts made by the Royal College of Veterinary Surgeons to regulate the general education of candidates for its diploma. Fortunately that history is spread over a comparatively short period, for until the year 1883 the Royal College of Veterinary Surgeons left the subject of general education entirely to the teaching colleges. For present purposes it is not necessary to consider the steps which the schools took to exclude the absolutely uneducated from their benches, but it is a notorious fact that the standard of examination was very low. I am not prepared to say that it was unnecessarily low, or that the Royal College of Veterinary Surgeons failed in its duty in not, at an earlier period in its history, taking the control of the general education of veterinary students into its own hands. In order to form a sound opinion on this point regard must be had to a number of circumstances which I shall consider later in discussing the adequacy or inadequacy of the standard of examination at present in force.

In the year 1882 the Council passed regulations regarding the examination of veterinary students in general education. They specified the examining bodies whose certificates would be accepted as sufficient evidence of general education, and ordained that intending students who could not produce one of these certificates would be examined by the College of Preceptors in England, by the Educational Institute in Edinburgh, and the High School in Glasgow. To a large extent those regulations remained a "dead letter," and, at any rate, the Council never attempted to exercise any real supervision or control over the examinations. Probably the main reason of this remissness was a doubt as to whether the original Charter empowered the Council to institute an examination in general education. The supplementary Charter obtained in 1882 expressly affirmed the right of the College to require all students to undergo an examination in general educational knowledge in such subjects, and subject to such regulations as the Council determined.

The power of the Royal College of Veterinary Surgeons to exact evidence of general education for students having been thus placed beyond doubt, the Council speedily proceeded to exercise it. Indeed before the supplemental Charter had actually been granted, viz., on the 21st of July 1892, the following bye-law was passed :—"On and after the 7th September 1893, students who enter the veterinary schools shall, prior to their first

professional examination by the R.C.V.S., produce a certificate that they have passed the preliminary general educational examination in force after 1st January 1892 of the General Medical Council, or produce an educational certificate recognised by that body to the Secretary of the R.C.V.S.

It will be observed that the Council gave more than a year's notice of the introduction of the new regulation, and as a matter of fact the bye-law did not come into full effect till two years after it was passed, as most of the students who entered the schools for the session 1893-94 were formally enrolled before the 7th of September 1893.

This bye-law was open to two objections, the first being that, contrary to the fact, it seemed to imply that the General Medical Council itself conducted an examination in general education; and the second that it also appeared to bind the Royal College of Veterinary Surgeons without any notice to follow the lead of the General Medical Council in the event of that body amending or altering its bye-laws on the subject of general education. It is possible that such was the real intention of the Council at the time being, but it is not clear that that was the case. From the published report of the proceedings of the Council (*The Veterinarian*, 1892, p. 617), it is clear that the original motion, of which Captain Raymond was the mover, was differently worded, and specified the examination "of 1st January 1892," and the report does not show why "in force after 1st January 1892" was substituted. If it was the intention of the Council to bind the Royal College of Veterinary Surgeons to adopt without discussion such alterations in the standard of the examination in general knowledge as the General Medical Council might think necessary for medical students, I think the step was unwise. It happened, however, that the General Medical Council did not during the next few years make any alteration in the standard of the examination in force on the 1st January 1892, and consequently the substitution of "in force after" for "of" was deprived of the importance which it might otherwise have had.

Since, as already indicated, the General Medical Council did not, and does not now, hold any examination of its own, the new bye-law simply bound the R.C.V.S to accept or reject a certificate presented by a veterinary student according as it was, or was not, contained in a published list of examining bodies recognised by the General Medical Council on the 1st January 1892, and this list was incorporated with the bye-laws in the published Register of the R.C.V.S. for the year 1893 and subsequent years.

I come now to a period of which the events are probably still fresh in the recollection of most members of the profession. As previously mentioned, the new bye-law came into force on the 8th of September 1893, and hence all the students who entered the colleges for the first time in the autumn of 1894 were subject to it, and therefore had to produce, before they could be admitted to the first professional examination, one of the certificates approved by the General Medical Council, a list of which had been published for the information of the teachers and intending students. From the very outset the Secretary to the Examining Board in Scotland accepted certificates which were not in that list, and notably he received and accepted as sufficient certain certificates from the Educational Institute of Scotland other than the one specified in the regulations of the General Medical Council and the bye-law of the R.C.V.S. The only recognised certificate of that body was the certificate of the preliminary medical examination, and an express condition of that examination was that all the specified subjects

must have been passed at one time. When this irregularity was discovered in 1895, it was upheld by a majority of the members of the Council, in opposition to the opinion of the Solicitor of the College, and of the opinion of counsel specially consulted on the point. This, of course, was giving an interpretation to the bye-law which certainly was not intended by the Council who passed it, and at the election of members of Council which took place in 1896, the profession indicated in an unmistakeable fashion that they disapproved of the plan of accepting piece-meal or divided certificates granted by examining bodies from whom the General Medical Council and the bye-law of 1893 required an undivided certificate—that is to say, a certificate granted on the result of one examination, and including all the necessary subjects.

At its first meeting after the election, viz., in July 1896, the Council passed the following bye-law:—"Students who enter the veterinary schools shall, prior to their first professional examination by the R.C.V.S., produce a certificate entitling the holder to be registered as a medical student on June 30th, 1896."

This bye-law was framed with the express purpose of adopting the then existing standard of examination of the General Medical Council, without binding the R.C.V.S. to follow that body in the event of its raising the standard, and that was made clear by Vet.-Captain Butler and others in the course of the discussion. It is important to note that, while a considerable number of members of Council were opposed to the proposed new bye-law no one who took part in the discussion suggested that we should bind ourselves to follow the General Medical Council in the event of the preliminary examination for medical students being made more difficult. It is also worth notice that Professor Dewar expressed himself as entirely opposed even to adopting the list of examinations then or at any time recognised by the General Medical Council.

That the Council was wise in framing its bye-law on general education in terms that did not compel it to adopt any alteration in the standard of examinations subsequently made by the General Medical Council was soon made manifest, for in the following year that body resolved that the standard should be raised to a very considerable extent. The new regulations of the General Medical Council made the second-class certificate of the College of Preceptors no longer acceptable from medical students, and also required the Educational Institute of Scotland to raise the standard of their preliminary medical examination. In October 1898, and again in April last, Professor Dewar sought to induce the Council to sanction a special examination for intending veterinary students by the last-named body, and examination to be conducted on the same lines as their preliminary medical examination in force on June 30th, 1896. To this proposal the Council refused to assent, mainly I think because they felt that it was undesirable to recognise an examination that was not of a public character, but held exclusively for veterinary students, and partly because it transpired that the College of Preceptors had offered to hold branch examinations in Edinburgh and Glasgow at which intending veterinary students in Scotland could present themselves for the examination for a second-class certificate. One would have thought that this offer would have entirely satisfied the Principals of the Scotch schools, since they maintain that the examination for a second-class certificate of the College of Preceptors is an easier examination than the one now conducted by

the Educational Institute of Scotland, and not more difficult than the examination which that body conducted under the regulations of the General Medical Council in force at 30th June 1896. Strange to say, however, Professor Dewar, and I believe the representatives of the two other Scotch schools, refuse to accept this solution of the alleged grievance, on the ground that the schools in Scotland demand as a right a Scotch examination, and this although the majority of the students who study in Scotland are English, Welsh, or Irish.

After several unsuccessful attempts to persuade the Council to sanction a special examination by the Educational Institute of Scotland, Professor Dewar, at a meeting of Council held last month, after due notice brought forward a motion to raise the standard of the general knowledge examination to the level of that now in force for medical students, and to any higher standard which the General Medical Council may subsequently introduce. This would have been a sufficiently startling proposal even if it had been coupled with a provision that it should not come into force until a reasonable notice of the alteration had been given to the schools, but the motion contained no such provision, and had it been passed the majority of the students who entered the College this session, with certificates eligible at the date of their entry, would have had these certificates refused when they presented themselves for examination next May or July. I do not hesitate to characterise this proposal as an enormity, and it seems hard to believe that nine Members of Council solemnly voted for it, and would actually have carried it if they had succeeded in persuading the President of the College to vote with them. I intend presently to give reasons for regarding the proposal as unwise and inexpedient, inasmuch as it would have greatly increased the severity of the entrance examinations sanctioned by the General Medical Council and adopted by the R.C.V.S. in 1896, but at the present moment I desire to point out the great injustice which these nine Members of Council were anxious to perpetrate on students who have already begun their studies, provided with certificates that are at this moment acceptable under the existing bye-law. It is consoling to reflect that had the motion been carried the students affected by it could have successfully invoked the aid of the law courts to exempt them from its operation, but that is a remedy which I feel sure no member of the profession desires to see enforced. The Council of the Royal College of Veterinary Surgeons has the strict legal and moral right to raise the standard of the preliminary examination to any height that is considered justifiable in the interests of the profession and the public, but it has not the legal right to withdraw from the bargain which it has tacitly entered into with students who have already begun their studies, and it is morally bound to give reasonable notice of any alteration to those who have not yet entered the Colleges, but are engaged in preparing for the general knowledge exemination.

But putting aside the illegal and immoral aspects of the motion which was very nearly carried at last meeting of Council it will be observed that it proposed to raise the present standard of examination and to compel us to adopt without notice or discussion any alteration in the standard which the General Medical Council may subsequently introduce. The advisability of doing either of these things deserves to be seriously considered by the members of the profession. The second of them, that is to say, the proposal that we should commit ourselves to blindly follow-

ing the lead of the General Medical Council in this matter of general education, is, I think, indefensible. Not a word could be said against the adoption of the standard of general education now enforced by the General Medical Council if after full consideration that standard appeared to be suited to the requirements of the public and the veterinary profession, but for the Council of the R.C.V.S. to bind itself to accept whatever alterations the General Medical Council may make in the future would surely be a foolish course.

There remains for consideration the other point, viz., the advisability of raising the present standard of examination in general knowledge. And here let me guard against a very serious misrepresentation of the effect of the proposal which has been put forward. It has been said that the proposal if carried into effect would only have raised the standard of examination in England, since it is already raised to the present standard of the General Medical Council in Scotland. That is an absolutely false statement. No certificate that is at present acceptable from a student who has studied in England can be refused from another who has studied in Scotland, and no examination of which the certificate is at present recognised is open only to English students. On the other hand, to adopt the existing regulations of the General Medical Council would amount to a raising of the standard of examinations both in Scotland and England, since it would compel the Council to refuse certificates which are now acceptable, and force intending veterinary students to present themselves for examinations that are more difficult to pass.

That point having been disposed of, let us see what considerations ought to be taken into account, in determining what standard of examination in general knowledge is at any given time a proper one. In my view this question is governed by only one consideration, viz., what is the highest standard that can be enforced without detriment to the public interest? The question of the welfare of the schools has absolutely no place here.

At a recent Council meeting the Principal of one of the schools employed as an argument for reconsideration of the standard of examination the fact that his receipts from students' fees had within the last few years declined by about £1000 per annum, but although the school with which I have the honour to be connected has also suffered financially in consequence of the adoption of a higher standard of examination in general knowledge, I recognise the fatuity of urging this as a reason why the standard should be lowered. Similarly I recognise that it would be no valid argument against adopting a still higher standard to foretell the consequent ruin of the schools.

I repeat that the only important point to be considered in this connection is the effect of any alteration of the standard on the public interest. To adopt too low a standard of examination would be opposed to the public interest, because, other things being equal, the public will be the better served the better the members of the profession have been educated in matters of general knowledge. On the other hand, the interest of the public would be injured by making the preliminary examination so severe as to cut down the members of the profession beyond what is reasonable to meet the requirements of the public services and the owners of animals. Judging in this way, I hold that the adoption of a higher standard of general education in 1892 was wise and necessary, and that a

further increase in the severity of the educational test at the present time is unwise and unnecessary.

The alteration made in 1892 was justified, because it appeared certain that if the standard were not raised the numbers entering the profession would soon be much in excess of public requirements, and that the profession might be adequately recruited with men of better education. Mr. Hill, the Secretary of the Royal College of Veterinary Surgeons, has provided me with some statistics which I should like to quote in this connection. These show that during the last six years of the old system the average number of new members added annually to the profession was 190, and that during the same period the Register (including qualified members and registered practitioners) grew from a total of 3451 to 3836.

Is there any indication that we are at present returning to a similar state of things? The answer to that is contained in the following figures. During the last three years for which we have complete returns the average number of new members with the higher educational certificates added annually to the Register has been 66, and the total growth of the Register for the last four years (again including both qualified members and registered practitioners) has been 7—3877 in 1897, and 3884 in 1900.

I do not intend to be guilty of the unfairness of omitting to point out that another cause has combined with the more difficult preliminary examination to bring about this result, viz., the addition of a fourth year to the curriculum. No figures can be quoted to prove the share in the result which belongs to each of the two factors, but I think no teacher will deny that by far the more potent of the two in cutting down the number of new members has been the more difficult preliminary examination. If any doubt were cast on this estimate it would only be necessary to point out that the addition of a third year to the curriculum in 1877 had practically no material effect in checking the growth of the Register. There cannot, I think, be any doubt that if we were to leave the period of study as at present, but return to the old standard of examination in general knowledge, there would immediately be such an influx of new students as would bring about an over-crowded state of the profession.

The following tabular statement speaks eloquently of the effect of the new regulations which came into force in 1899:—

TABLE SHOWING THE TOTAL NUMBER OF STUDENTS PRESENTED FOR EXAMINATION FROM EACH OF THE SCHOOLS SINCE 1894.[1]

	1894	1895	1896	1897	1898	1899
Royal Veterinary College	402	342	291	232	240	226
Dick " "	285	260	200	186	136	97
New " "	214	161	162	117	113	92
Glasgow " "	145	120	119	96	77	55
Total	1046	883	772	631	566	470

[1] They came into force in 1893, but students under them first came up for examination in 1894.

An examination of this table will enable any one to estimate roughly what effect the introduction of the present standard of examinations in 1893 has had on the finances of the schools, and what is of more importance in the present connection, on the finances of the Royal College of Veterinary

Surgeons. It also makes it difficult to understand what motive other than an excess of suicidal mania could induce either the teaching schools or the Royal College of Veterinary Surgeons to raise the standard of the general knowledge examination at the present time.

A great deal of nonsense has been spoken and written regarding the indignities and losses that the profession will bring upon itself if it does not for all time keep its general knowledge examination on a level with that of the General Medical Council, and it is somewhat significant that most of those who are now clamouring loudly for a further advance are precisely those who were opposed to the bye-law that increased the severity of the educational test in 1893. There is no indignity in keeping the standard we have at present, but our reputation would assuredly suffer if we now hastily adopted a standard from which we should soon have to recede. Prudence suggests that we should not move forward in that direction at present, but should the number of students entering the colleges ever come to approach the figures of ten years ago a further advance would in my opinion be justified.

I maintain that the considerations which I have laid before you prove that it would be unwise and dangerous to do what nine members of Council were anxious to do at last meeting of the Council. It may, however, be asked whether I have any proposal to make in order to remove the grievance under which the representatives of the Scotch Colleges allege they are suffering. The debates around the Council table have recently served to show that grievance in its true proportions. It has come to light that they can have for the asking the very examination for which the majority of students in England present themselves, viz., the examination of the College of Preceptors for a second class certificate, but they declare that they cannot bring themselves to accept any examination which is not a Scotch one. I confess I am unable to understand that attitude, but if the Council of the Royal College of Veterinary Surgeons thinks it is a justifiable and reasonable one I see no objection to the institution of a special examination, provided it is not easier than the examination of the College of Preceptors for a second class certificate, and provided it is made available in England and Ireland as well as in Scotland.

A PLEA FOR BROADER TENDENCIES IN VETERINARY INSTRUCTION.[1]

BY LEONARD PEARSON, B.S., V.M.D., PHILADELPHIA, PA.

THE past year has been one of great progress in our Association affairs and in the development of our profession. The schools are receiving more support and are improving. Laboratories for research work in comparative pathology are being improved and enlarged, and new ones have been established. Under the stimulus of increased demand for their services and higher rewards, the veterinarians of the country have given more attention to their organisations, have strengthened them, and, by co-operation, advanced the status and the conditions governing their calling.

[1] Abstract of the address of the President of the American Veterinary Medical Association, Detroit, Michigan, September 4, 1900.

The development during the past decade of knowledge of disease and of effective methods of prevention and cure have been marvellous indeed. It is gratifying to consider that much of this advancement has been the work of comparative pathologists and of veterinarians. It is only quite recently that the advantages have been recognised that may be derived from the study of comparative pathology in relation to the development of the whole subject of disease, and especially to human diseases. In fact, scarcely any attention was paid to this subject until Bollinger explored the almost virgin field of animal pathology thirty years ago. Virchow and Birch-Hirschfeld also recognised the value of the broadening discipline and the new lights to be derived from the study of the diseases of animals. More recently attention has been forcibly drawn to this subject by the researches of Johne, Kitt, Nocard, &c. In bacteriology, a younger branch of pathology, students have not been bound by such rigid traditions, and so they have not drawn sharp lines between genera and confined their studies to the organisms that attack a single kind of animal. Many bacteriologists, following the example of the great leaders, Pasteur and Koch, have studied the bacterial diseases of useful animals.

The idea is gaining ground that disease must be studied as disease in the broadest sense possible, and not, as heretofore, as a morbid process confined to a part of the body of a single species of animal.

"Comparative pathology" already has a familiar sound, and many laboratories are being erected or equipped and enlarged to make special provision for this new development. This movement is evident not only in this country, but abroad as weil, and notably in Germany. These laboratories are usually connected with medical schools or Government health departments. One result of this, it is hoped, will be to throw new light on many of the obscure points in the pathology of the diseases of animals and help to overcome the condition that Johne described in explaining why he did not finish his text-book on pathology that was announced ten years ago. He said: "The pathological institutes in human medicine are filled with young physicians who have sought and found in this field a subject for a thesis or are undertaking advanced work. This results, at least, in the accumulation of a plentiful amount of material that without too much labour can be sifted and worked over. Thus building-stones are made from which the master can erect a building. Of this, veterinary pathology has nothing. The teacher of veterinary pathology is not supplied with sufficient help, and has scarcely time to attend to the current work of his department, the post-mortems and courses and lectures, if he is thorough in them. There are no positions to strive for or other encouraging conditions to attract young veterinarians to provide building-stones for great text-books."

Since these words are true of the conditions in America even more than in Germany, we hail with joy any movement that promises to provide facilities for and to encourage workers in comparative pathology. In view, however, of the existence of these great laboratories and the numerous pressing demands on the public exchequer and the funds of universities, it will become more difficult to establish special laboratories for veterinary pathology.

But it is not at all likely that this development will fail to receive a warm and sympathetic welcome. We must not be content with this betterment, however, nor should we lightly fall into the error of thinking that this is all

Surgeons. It also makes it difficult to understand what motive other than an excess of suicidal mania could induce either the teaching schools or the Royal College of Veterinary Surgeons to raise the standard of the general knowledge examination at the present time.

A great deal of nonsense has been spoken and written regarding the indignities and losses that the profession will bring upon itself if it does not for all time keep its general knowledge examination on a level with that of the General Medical Council, and it is somewhat significant that most of those who are now clamouring loudly for a further advance are precisely those who were opposed to the bye-law that increased the severity of the educational test in 1893. There is no indignity in keeping the standard we have at present, but our reputation would assuredly suffer if we now hastily adopted a standard from which we should soon have to recede. Prudence suggests that we should not move forward in that direction at present, but should the number of students entering the colleges ever come to approach the figures of ten years ago a further advance would in my opinion be justified.

I maintain that the considerations which I have laid before you prove that it would be unwise and dangerous to do what nine members of Council were anxious to do at last meeting of the Council. It may, however, be asked whether I have any proposal to make in order to remove the grievance under which the representatives of the Scotch Colleges allege they are suffering. The debates around the Council table have recently served to show that grievance in its true proportions. It has come to light that they can have for the asking the very examination for which the majority of students in England present themselves, viz., the examination of the College of Preceptors for a second class certificate, but they declare that they cannot bring themselves to accept any examination which is not a Scotch one. I confess I am unable to understand that attitude, but if the Council of the Royal College of Veterinary Surgeons thinks it is a justifiable and reasonable one I see no objection to the institution of a special examination, provided it is not easier than the examination of the College of Preceptors for a second class certificate, and provided it is made available in England and Ireland as well as in Scotland.

A PLEA FOR BROADER TENDENCIES IN VETERINARY INSTRUCTION.[1]

BY LEONARD PEARSON, B.S., V.M.D., PHILADELPHIA, PA.

THE past year has been one of great progress in our Association affairs and in the development of our profession. The schools are receiving more support and are improving. Laboratories for research work in comparative pathology are being improved and enlarged, and new ones have been established. Under the stimulus of increased demand for their services and higher rewards, the veterinarians of the country have given more attention to their organisations, have strengthened them, and, by co-operation, advanced the status and the conditions governing their calling.

[1] Abstract of the address of the President of the American Veterinary Medical Association, Detroit, Michigan, September 4, 1900.

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The idea is gaining ground that disease must be studied as disease in the broadest sense possible, and not, as heretofore, as a morbid process confined to a part of the body of a single species of animal.

"Comparative pathology" already has a familiar sound, and many laboratories are being erected or equipped and enlarged to make special provision for this new development. This movement is evident not only in this country, but abroad as weil, and notably in Germany. These laboratories are usually connected with medical schools or Government health departments. One result of this, it is hoped, will be to throw new light on many of the obscure points in the pathology of the diseases of animals and help to overcome the condition that Johne described in explaining why he did not finish his text-book on pathology that was announced ten years ago. He said: "The pathological institutes in human medicine are filled with young physicians who have sought and found in this field a subject for a thesis or are undertaking advanced work. This results, at least, in the accumulation of a plentiful amount of material that without too much labour can be sifted and worked over. Thus building-stones are made from which the master can erect a building. Of this, veterinary pathology has nothing. The teacher of veterinary pathology is not supplied with sufficient help, and has scarcely time to attend to the current work of his department, the post-mortems and courses and lectures, if he is thorough in them. There are no positions to strive for or other encouraging conditions to attract young veterinarians to provide building-stones for great text-books."

Since these words are true of the conditions in America even more than in Germany, we hail with joy any movement that promises to provide facilities for and to encourage workers in comparative pathology. In view, however, of the existence of these great laboratories and the numerous pressing demands on the public exchequer and the funds of universities, it will become more difficult to establish special laboratories for veterinary pathology.

But it is not at all likely that this development will fail to receive a warm and sympathetic welcome. We must not be content with this betterment, however, nor should we lightly fall into the error of thinking that this is all

of the veterinary sciences. We must not allow the other essential veterinary sciences to be neglected and fail to develop in proportion to their fellows and their own innate importance.

If comparative pathology is taken up by laboratories usually conducted by physicians and principally for the purpose of throwing light on the diseases of man, and if our veterinary teachers must go to this source for their facts, we must not allow all of the veterinary sciences to be humanized in this way and developed as side issues to subjects that are conceived to be more important.

It is evident that our veterinary schools and veterinary departments of universities must always stand on independent bases if they are to properly fulfil their function. It will never do for them to become subsidiary departments incidental to schools of medicine, for example. If any arguments are needed to support this contention they may be found in the vast importance to the nation of the interests that are protected and fostered by veterinarians and in the histories of veterinary schools in other countries.

First, veterinarians guard the greatest income-producing property in the United States. Live-stock husbandry is the most profitable branch of our agriculture; it feeds more people and furnishes more homes than any other branch of manufacturing commerce or trade. It furnishes material for exports amounting to more than $200,000,000 per annum. It represents an investment of more than $2,000,000,000. The success of our agricultural population, comprising 58 per cent. of the people of the country, depends on their horses, cattle, sheep, swine, and poultry more than on any other factor.

Moreover, the butchers, milk dealers, creameries, woollen mills, tanneries, shoe factories, hat factories, and numberless other smaller interests and industries depend on animals and animal products. The protection and development of such interests as these are worthy of the most earnest attention of statesmen, scientists, and educators.

Second, the experiment has been tried in Europe of establishing veterinary chairs in universities and attempting to provide veterinary courses without independent faculties and the complete equipment of a veterinary school. Such experiments at Halle, Leipsic, and Giessen have failed. The successful work of investigation and instruction in the veterinary sciences in Europe is done in separate veterinary schools, as at Berlin, Dresden, Hanover, Alfort, London, and Vienna. There are, perhaps, three seeming exceptions to this rule. In Berne the veterinary school has during the past year been made a department of the university, but its separate plant and faculty are preserved. In Copenhagen and Buda-Pesth the veterinary schools are associated with schools of agriculture, but each has its special equipment and faculty, and this union appears to be advantageous to both institutions.

If the veterinary sciences are dominated by comparative pathology there is danger that the point of view of the veterinarian will become narrow, and that he will not be competent to apply to the best advantage the knowledge of comparative pathology that he possesses. This statement may at first seem paradoxical, but my thought is that it is necessary for a veterinarian to be thoroughly familiar with animals in health before he can treat them successfully *or economically* when they are diseased. It is necessary to know the breeds, values, foods, methods of rearing, using,

&c., in order to be in a position to discover and remove causes of disease or advise appropriate treatment. This idea was illustrated to me by Professor Dieckerhoff, who said of a certain eminent physiologist, a professor in a veterinary school,—"He could teach veterinary physiology better if he could ride,"—that is, if this great scientist had possessed some familiarity with animals he could have extended and applied his profound knowledge beyond the walls of his laboratory and lecture hall to animals in the stable and pasture. There is as much in the application of principles as in propounding them. It is not enough to have a set of tools; one must know how to use them.

In spite of the prevailing popular impression, the veterinarian is more than a doctor of diseased and maimed beasts; and he is himself responsible for the narrow bounds that circumscribe his field of labour in the popular mind. In this country the title "doctor" does not commonly convey the impression of a learned man, but to the plain person it signifies one who doctors. Now, veterinarians have insisted upon the title of doctor, whether conferred upon them by their college or not, and the result has been that they are commonly regarded as men whose sole business is to doctor anîmals, and this is considered the single object and the end of their technical equipment.

In other countries veterinarians do not covet the title of doctor, and it results that they are not regarded as members of the least important branch of a noble profession, but stand on footing of their own.

Partly on account of the narrowing effect of a useless title, and partly through failure to realise the importance of the subject, veterinarians have not cultivated to the extent they deserve what might be called the physiological phases of animal husbandry. With his knowledge of comparative anatomy, physiology, chemistry, foods, and the predisposing and exciting causes of disease, the veterinarian should be the natural expert on conformation, selection for special purposes, breeding, rearing, feeding, &c. He should also be thoroughly informed on stable construction and other practical questions related to the maintenance and utilisation of animals.

As expert landscape gardeners, civil engineers, and architects are consulted on the problems within their professions, so should veterinarians be consulted on the problems within their profession covering all phases of animal husbandry. Before this can occur largely it will be necessary for the public to relinquish the idea that veterinarians are useful only to patch up decrepit animals or to check the spread of disease, however important this may be, and be educated to regard them as experts in animal husbandry—as animal engineers.

It is also necessary that our schools shall devote more attention to these subjects. At present our knowledge of some parts of them is almost purely empirical; it remains for veterinarians to formulate it and place it on a scientific basis, whence it may advance. Most of the accurate work that has been done in these lines has been done by veterinarians, beginning with the illustrious Bourgelat; but there is an enormous field that is still untouched.

This Association can do much to broaden the scope and practice of the veterinarian. It can encourage the preparation and reading of papers relating to the subjects that are usually grouped under the title "Animal Husbandry." It can appoint committees to report on special problems coming under this head. It can recommend the amplification, the deepen-

ing and broadening of instruction in zoötechnical and allied subject in the veterinary schools. When all this is done the veterinary profession will be in more direct touch and in closer sympathy with the stockman, and cannot fail to be of more service to the live-stock industry and to itself profit by these more intimate bonds.

This thought must have been in the minds of those who planned and organised the federal Bureau of Animal Industry. It is fortunate that this bureau is established on broad lines; that it is not the bureau of comparative pathology or the bureau of veterinary police, but that its purpose is to improve the animal industry in all of its departments and relations, and that its organic law is broad enough to permit this.

In the same way, so far as an individual may, each veterinarian should extend his knowledge and his practice and become an expert in animal engineering.

In dwelling upon this as a legitimate and desirable field of effort I have not wished to appear antagonistic to any work the profession or this Association may now have in hand. It is all important and should all be strengthened. It is your high duty as the representative body of the veterinary profession of North America—as the Veterinary Senate—to point the way of advance and to strength the hands of the labourers in the field.

IMPORTANT HORSE CASE.

His Honour Judge Steavenson held a Court at Carlisle on Wednesday, 15th December. The solicitors present were Mr. Errington (Registrar), Mr. Lightfoot, Mr. Edwards, Mr Broughton, Mr. Gibson, Mr. Steele, Mr. Rigby, and Mr. Mawson.

His Honour resumed the hearing of the action in which James Crone Beattie, farmer, Kingside Hill, Abbey Town, sought to recover the sum of £53 : 13s. from William Griffiths, farmer, Castlesteads, Plumpton, being the price of a bay cart gelding, two and a half years old, sold by the plaintiff to the defendant at Messrs. Harrison's Auction Mart, Carlisle, on Friday, September 21st. Mr. Gibson appeared for the plaintiff, and Mr. Lightfoot for the defendant. The case had aroused considerable interest, and a large number of expert witnesses had been retained to give evidence in it. The question in dispute was whether the horse was sound or unsound at the time it was sold at Messrs. Harrison's Mart. The defendant in his evidence, which was given at the last Court, stated that he observed that there was something wrong with the horse soon after he purchased it, and a day or two afterwards he had it examined by Mr. Hewson, V.S., who gave a certificate that it was lame in the off fore-leg and had also a nervous defect in both hind legs, and was therefore unsound. The horse was returned to the Mart and resold for 42 guineas, the plaintiff himself being the purchaser. Amongst the witnesses called on behalf of the defendant at the last Court was Professor Dewar, of Edinburgh, who examined it on the 10th November and found it to be lame in the right fore-leg. He discovered no trace of stringhalt, but said it did not follow from that that the animal did not suffer from that disease, which was not always discoverable. One of the feet was larger than the other. Mr. Joseph W. Hewson, V.S., said the horse was brought to his yard on Monday, September 24th, and was there care-

fully examined by him. Altogether he spent two hours or more over the horse. The animal distinctly pulled his off hind-leg, and was going lame on the off fore-leg. It was only after considerable trial that he discovered the stringhalt. That disease was very difficult to discover, especially in the early stages. In cross-examination the witness said he was not surprised that others did not find any trace of stringhalt. The circumstances under which the horse was examined might account for that. The lameness came from the foot. Stringhalt was a progressive disease, and it was more manifest at the time the horse was resold than at the time the animal was examined by himself. Mr. T. Threlkeld, V.S., Kirkoswald, who examined the horse on September 27th, said he found distinct traces of stringhalt in the off hind-leg, and of lameness in the off fore-leg. The lameness was the most serious defect: it came from the hoof, which was contracted. Mr. W. C. Croudace, V.S., Haltwhistle, who examined the horse on the 28th, said he found it suffering from stringhalt. He saw no lameness. Mr. Henry Thompson, V.S., Aspatria, gave similar evidence. In cross-examination he said stringhalt was not always manifest. He was not surprised that other veterinary surgeons did not find traces of the disease. Mr. Lightfoot said that was the case for the defendant.

His Honour asked where the horse was? On being told that it was at the plaintiff's, he said he thought he should see it. He was sitting at Wigtown to-morrow (Thursday), and he would like it to be taken to Messrs. Hope's Auction Mart that night and left for his examination. Mr. Gibson said that would be done. Addressing his Honour, Mr. Gibson said the professional witnesses for the defendant stated that stringhalt was not always discoverable, but he would call some of the greatest experts in the country, and they would tell the Court that stringhalt was always manifest. Mr. John Bell, V.S., Carlisle, deposed that he was called by Mr. Harrison to see the horse on Monday, September 24th, and made five thorough examinations of it between that date and December 3d, and unhesitatingly pronounced it to be sound. To give the experts the best opportunity of examining it for a nervous affection, he had it brought to Carlisle by railway and placed in his stable. A nervous disease was more easily discoverable after a horse had rested after a railway journey than under any other circumstances. This horse was not returned for stringhalt; the cause set out in Mr. Hewson's certificate was that it was suffering from a nervous disease, and the examinations were directed to the discovery of any nervous disease. Stringhalt was always observable by an expert, but there were other nervous diseases which were not always observable. "Once stringhalt always stringhalt," which was a particular disease of the nerves. This horse had never suffered from stringhalt or any other nervous disease. In cross-examination the witness said he disagreed with Professor Dewar's statement that stringhalt might be observable one day and not again observed for a week. The existence of stringhalt was always ascertainable. It was more easily observable under certain circumstances than under others, but an expert would discover it any day and every day, and under any circumstances. Mr. Steel, V.S., Wigton, who has also made repeated examinations of the animal, said it did not suffer from stringhalt or any nervous disease, or from lameness. Stringhalt was always discoverable. Mr. M'Nairn, V.S., assistant with Mr. Steel, gave similar evidence. Professor Penberthy, of the Royal Veterinary College, Camden Town, who is veterinary referee for the Royal Agricultural Society, the Royal Dublin Horse Society,

and Tattersall's, stated that he and Professors M'Call and Williams made independent exhaustive examinations of this horse in Mr. Bell's yard on the 20th November. They took every possible means at their disposal to see if the animal was sound, and there was not the slightest evidence of unsoundness. The horse had not stringhalt, and had no disease on the off fore-foot. An expert had no difficulty in discovering stringhalt. In cross-examination the Professor said the witnesses who spoke to seeing the horse draw its leg in the mart fairly correctly described the conditions of stringhalt. He could not, however, conceive that they saw the action they had described. Men who attended auction marts were but human, and it was possible that one of them said, "That horse is a wrong one," and they all rushed at that opinion. The tests at the examination in Mr. Bell's yard could not be more severe, and they failed to discover nervous disease. In answer to his Honour, the witness said he did not agree with Professor Dewar that stringhalt could be observed one day and not be seen again for a week. There were certain circumstances under which it was more manifest than under others. Professor Owen Williams, of the New Veterinary College, Edinburgh, said the tests to which he and Professors Penberthy and M'Call subjected this horse was the most severe he had known a horse subjected to for some time. The animal was not suffering from stringhalt or any nervous disease. Professor M'Call, who has been Principal of Glasgow Veterinary College for forty-one years, also gave evidence to the effect that the horse was sound. The tests were most severe, and his experience showed that they must have disclosed stringhalt if it had existed. The hoofs of the horse's fore-feet were taped after the last Court, and the hoof of the off fore-foot proved to be, if anything, the larger of the two.

Judge Steavenson gave his decision in the case at the Wigton Court on 6th December. His Honour first went and "viewed" the horse at Hope's Auction Mart. He gave his decision on returning to Court. The question in the case, he said, turned out to be one entirely of fact, a simple question of soundness. It had been a remarkable case, one of those which showed from time to time how very little they knew about a horse. He would be the last to dogmatise upon anything he had seen that day. He reprobated very much the way in which one or two witnesses at Carlisle on Wednesday, skilled men, said they could not possibly make a mistake. It would have been more becoming even in the case of a very skilful witness to say "In my judgment," so-and-so. Had this horse stringhalt? And was one of its fore-feet smaller than the other—which smallness was an indication that it had shrunk, and amounted to unsoundness, and in fact lameness? The defendant called five or six skilled veterinary surgeons, and amongst them Professor Dewar. He gave the greatest credit to the Professor, who said he did not see stringhalt, but he did see that which amounted to unsoundness in the fore-foot. One was smaller than the other, he said. The plaintiff called six witnesses to rebut the allegations of unsoundness, amongst them being Professor M'Call, who gave most excellent evidence. It was not too dogmatic, but simple, straightforward evidence. He admitted a great deal that Professor Dewar had said. He admitted the difficulty there might be in discovering stringhalt. All the other witnesses for the plaintiff said they examined it several times or for a very long period. He did not doubt that they in their own minds knew perfectly well that to discover springhalt in a horse of this age, when the disease was only beginning, was a matter of some difficulty, and

might be overlooked. He regretted that he had not come to a conclusion which was very satisfactory to either the parties or to himself. He thought it was necessary for him to have a view. He did not think he would learn more than such a number of professional men would have learned, but he thought he might have learned a little as to the facts. For instance, he thought he might learn whether one hoof was smaller than the other He also thought that from the accurate descriptions he had had as to the examination of a horse, he might detect stringhalt, which he had been acquainted with for many years. He desired to say, so far as his view was concerned, which he did not think of much value, that he saw not the slightest sign of stringhalt in the horse. Maybe he was unfortunate and came under Professor M'Call's definition, that you might watch a horse for nine minutes and not see anything, and the tenth minute he would show it. Therefore he put little faith in any examination he made himself. He measured the two hoofs with a pair of callipers, which he considered, from his own knowledge of mechanics, were better than a tape-line, and he was bound to say he saw a difference. But he saw no lameness, nothing to show that the hoof had shrunk; and his mind had not been influenced in this matter. His visit had not assisted him materially, but it had a little. He was driven to this conclusion. The onus of proof was upon the defendant. The defendant set up that the horse was unsound. He could not say that this had been proved to his satisfaction beyond all doubt. He thought, on the other hand, that the able evidence of the plaintiff, the number of witnesses called, and especially the evidence of Professor M'Call, was evidence which could not be gainsaid. It was not overweighted by the evidence called by the defendant. It was true that Professor Dewar disagreed with him, but he did say he did not see stringhalt. With regard to the smallness of the foot and lameness, he did not think there was much in that. Defendant had failed to prove his case, and there must be judgment for the plaintiff for the amount claimed (53 guineas) and costs. The horse had been sold in dispute, and he would be glad to answer any questions about that, to save any further litigation in this singularly unfortunate case.—Mr. Gibson said the cheque on the re-sale was at Mr. Harrison's, and Mr. Griffiths would get it.—Mr. Lightfoot said his client would take the amount realised on the re-sale.—(*Carlisle Patriot.*)

HORSE SICKNESS IN AFRICA.

EXTRACT FROM THE ANNUAL REPORT BY ALEXANDER EDINGTON, M.B., F.R.S.E. DIRECTOR OF THE COLONIAL BACTERIOLOGICAL INSTITUTE, CAPE OF GOOD HOPE.

THE Cape Colony Report refers mainly to the South African Horse-sickness, while the inoculation of cattle for the prevention of Red Water, and the manufacture and distribution to farmers of what is termed a "locust fungus," used for the destruction of locusts, appear also to have yielded valuable results.

The research and experiments in regard to the Horse-sickness have been laboriously conducted, and as now reported by Dr. Edington, are of distinct educational value to the veterinary profession. We accordingly quote the following extracts:—

" BACTERIOLOGICAL INSTITUTE,
" GRAHAM'S TOWN, *March 22d*, 1900.

" The Honourable the Colonial Secretary.

" Sir—I have the honour to submit my Annual Report for the year 1899.

" HORSE-SICKNESS.

" As you are well aware, very extensive investigations were in process of being carried out with a view to the discovery of some method by which in unhealthy districts horses and mules could be protected against the terrible ravages of Horse-sickness.

" In the Cape Colony proper this disease does not occur in an epidemic form annually; for reasons not yet clearly understood, the Colony is, more or less, free from an annual visitation, although when it makes its appearance in epidemic form the mortality is frightful. In Rhodesia, the Transvaal, the Free State, and areas lying within the same parallel it occurs every year, and in Rhodesia, where observations have been made, the annual mortality is more than 90 per cent.

" Not only, however, does the disease prove a costly item in the expenditure of the country by the direct loss in horse-flesh, but it seriously interferes with administration. Parties of police sent to patrol a distant area, or to inquire into native disturbances, very frequently have to leave their horses dead in the veld, and carry their saddles and accoutrements to the nearest station.

" It is therefore obvious in the opening up of Southern Central Africa, that a means which would promise to overcome this disease would prove of incalculable benefit.

" During the late period, when Rinderpest was raging in South Africa, my attention was largely diverted from investigations which I had in and to the study of that disease. Since that period, however, I have been enabled to take up the subject of Horse-sickness again, and to prosecute these inquiries to a successful issue.

" From time to time I have kept you informed of the advances which have been made and the methods with which I was working. These, however, were never more than tentative; thus the first method was one which promised to give a certain percentage of fully protected animals, with, however, a heavy attendant mortality in the process. The second was that by which an attenuated virus was obtained either by passage through a partially protected animal or by the adoption of certain laboratory methods carried out *in vitreo*. This latter method had an advantage in being attended with slight mortality, but was unsatisfactory in so far as no definite assurance could be given in regard to any particular animal that it had been fully protected. To assure oneself of this it was necessary, finally, to inoculate with blood of the highest virulence, when, if the animal was protected, it resisted this inoculation, but, on the other hand, if not so protected, it would die.

" Under the operation of this method it was clearly demonstrated that the more frequently the animals were inoculated with the attenuated virus the better was their chance of being protected. This system was, nevertheless, most tedious, and in an area infected with the disease neces-

sitated the animals being kept away from sources of possible infection for long periods of time.[1]

"One of the main difficulties in regard to this disease with which I have had to deal, and which I am happy to say I have finally overcome, was the extreme variation in susceptibility of different horses.

"The virulent disease, whether communicated naturally in the veld or by inoculation, has an energy so great, practically speaking, that no horse can withstand it. When, however, the virus has been attenuated, a different condition obtains. Now, one finds that the same attenuated virus which may kill some animals will only set up a mild fever in others, and in a considerable proportion of the remainder produce no obvious effect. These peculiar differences might well be compared to crushing walnuts with a steam-hammer on the one hand, and with light nut-crackers on the other. In the former case no resistance to the force of the hammer would be observable, and all would be crushed alike. When, however, the crushing force was reduced to that obtained from the nut-crackers, it would then be found, while some were easily cracked, that others would offer considerable resistance.

"The principle which I was endeavouring to apply was that of inoculation, first with a very attenuated virus, and subsequently with virus which had been less attenuated.

"If we could ensure an *exact gradation* between the different samples of virus, then the method would have been perfect. Unfortunately no means existed by which the true value of an attenuated virus could be determined, because, *as the reaction to attenuated virus varies enormously from animal to animal*, no animal exists upon which satisfactory tests could be made.

"Very elaborate experiments were carried out with the serum of animals which had recovered from the disease. These resulted in showing that no curative effects could be looked for from this material, even when used in enormous doses, and that the substance possessed no appreciable antitoxic property.

"I then determined to test serum taken from animals which, after recovery, had been reinoculated at intervals with increased doses of virulent blood. After the last inoculation a period of at least eight days was permitted to intervene, previous to bleeding the animal and collecting serum. This serum, when used in the presence of active infection, set up a blackwater, or hæmoglobinuria, which, if the infection was virulent, invariably ended fatally.

"Still later I made use of serum from animals, as in the last case, but which, after the final reinoculation, had been permitted to rest for a long period of time, and then reinoculated with a small dose of virulent blood.

"Blood of the highest order of virulence is carefully standardised and preserved. I have proved that the virulence of this material can be maintained for over two years absolutely unchanged.

"Standardised serum can be supplied which, bottled by careful aseptic management in the presence of an antiseptic, can be kept for long periods of time.

"A definite amount of this virulent blood is mixed with 50 c.c. of

[1] A large field experiment was begun on these lines in Rhodesia immediately previous to the outbreak of hostilities, but, owing to communications having been interrupted, it was impossible to carry the experiment to a conclusion.

serum and injected subcutaneously; some days later 30 c.c. of the same serum with the same dose of blood is injected; at a later date the procedure is repeated, with a reduced dose of serum, and fourteen days later pure virulent blood is injected.

"I am happy to say that this method leaves little to be desired, and affords a perfect and complete solution to the problem of protecting horses which have to live in unhealthy districts in South Africa.

"The method, as will be noticed, requires that inoculation shall be carried out in each animal four times, and it may be asked whether it is not possible to arrive at the desired end with less trouble. To that question I should undoubtedly say that in many cases the process might be shortened if the animals were carefully watched and their temperatures carefully registered. It is, however, to be noted that if the method is carried out, as I have arranged, animals can be fully protected *without setting up any severe febrile reaction.* If the method is shortened, then one has to recognise that the risk of high fever has to be met, and, if it ensues, that the animal will have to be carefully nursed.

"As it stands, therefore, we have a method which approaches the standard of almost *absolute safety*, while it has proved itself thoroughly efficacious, and, since it must fall to be carried out by individual farmers themselves, I prefer to advise a course which is devoid of great risk rather than one which would demand expert knowledge and guidance.

"In regard to the practical application of the method, the installation of heavy machinery necessary to the work, and other arrangements, which are already approaching completion, enables me to anticipate being able to meet any demand which may be made for material and apparatus.

"In view, however, of the number of prepared animals which it will be necessary to maintain, some additional stabling will be required, and provision made for a better water supply. I trust, in view of the enormous benefit which must accrue from the application of this discovery, that the Government will approve of such additional expense being incurred.

"REDWATER.

"The method which I have devised for the preparation of virus for the protection of cattle against this malady has continued to find favour with the stock-breeders in infected areas.

"In regard to the duration of the immunity conferred on inoculated cattle there is some little uncertainty. In some cases, especially where animals have been removed from infected to clean areas, it would seem that the immunity becomes lessened after a time. Experiments will be carried out during the year which may shed light on this and several other interesting questions pertaining to this disease.

"Apart from this theoretical side, it is most encouraging to recognise how the method has been taken up by the farmers, and led to an enormous saving of stock. Farms which had been closed to stock-breeding have, under its operation, been successfully reopened.

"HEARTWATER.

"Experiments are being prosecuted in regard to this malady, but I have been greatly impeded by the difficulty in obtaining virulent material for the production of the disease. So far I have been able to convince myself that it is useless to attempt to carry out investigations into this

disease, experimentally, in goats. These animals represent to the disease what the donkey does to horse-sickness, that is to say, the virus, in its passage through this animal, is frequently, almost usually, attenuated, and leads to experimental results which are at variance one with the other. Looking at this disease from the standpoint of pathology, I have little hesitation in saying that the key to the solution of this problem has been furnished by the investigations made into horse-sickness.

"What is now required to know is the species of animal which is most susceptible to the disease. In this inquiry I hope to have the assistance of my colleague the Colonial Veterinary Surgeon.

"LOCUST DESTRUCTION.

"During the year a determined effort was organised for the destruction of locusts. This was almost, if not, solely accomplished by means of the 'locust fungus' which was used by individual farmers, and by a travelling staff of five men who were under my direction.

"19,043 tubes of the fungus were supplied, and the results, as reported by farmers, magistrates, and others, were most gratifying.

"Unfortunately the sum voted for locust destruction under the vote on agriculture, amounting to £250, was quite inadequate to the maintenance of the five travelling officials, who were, therefore, withdrawn, and, I regret to say, since that time the efforts at destruction on the part of the farmers have become irregular, uncertain, and therefore more or less unavailing. I feel convinced that it is useless to look for a combined effort among the farmers unless it is encouraged and directed by proper authority.

"I have already suggested that persons, in various areas, should be so trained to use the fungus as to ensure the best results, and, were men available for this purpose, it would be possible to retain their services in their own districts when and where desired. Supposing such a reserve force to be available, four men might be retained as inspectors, whose duty it should be to see that destruction was being carried out in accordance with official instruction.

APPLIED MICROBIOLOGY.

"In connection with the practical application of bacteriological methods, for the detection of and preventing inoculation against disease, the following short summary will serve as an indication of the extent and character of the work which has fallen to be undertaken during the year:—

Vaccine lymph—38,271 tubes were supplied and 37 needles.
Lung-sick Virus—4200 doses and 15 needles.
Diphtheria Anti-toxin—66 bottles and 2 syringes.
Sponsziekte Vaccine—965 doses and 12 syringes.
Anthrax Vaccine—2375 doses and 15 syringes.
Locust Fungus—19,043 tubes.
Redwater Virus—1135 doses supplied to farmers and 7 syringes.
Redwater inoculations made for farmers at the Institute amounted to 229 head of cattle.

BACTERIOLOGICAL EXAMINATIONS.

Nature of Examination.	No.	Nature of Examination.	No.
Diphtheria,	10	Blood,	3
Typhoid fever,	34	Discharges,	3
Tuberculosis,	37	Analysis of milk,	1
Renal,	7	Animal examinations,	3
Tumours,	12		
Analyses of water,	28	Total,	138

CORRESPONDENCE.

Letters received, . . .	1920	Telegrams despatched, . .	415
,, despatched, . .	2662	Notes of advice, . . .	1218
Telegrams received, . .	765	Receipts issued, . . .	519

"In conclusion, I have to express my grateful acknowledgment of the assistance which I have received during the year from my clerical assistant, Mr. Thomas Hedley, B.A., and, in other branches, from Drs. Purvis and Robertson.—I have, &c.

"ALEXANDER EDINGTON, M.B., F.R.S. ED.,
Director.

"APPENDIX A.

"SOUTH AFRICAN HORSE SICKNESS.

"This disease, so far as is known, is peculiar to Africa.

"It has been known since the year 1780 as affecting Southern Africa, but probably exists also in more northern parts of this continent.

"In my Annual Report to the Colonial Government for 1894, as Director of the Bacteriological Institute, I have dealt at considerable length with the history of this remarkable disease, and it is, therefore, not requisite to enter with much detail into that side of the inquiry at this moment.

"While affecting the Transvaal and Rhodesia every year—beginning about the end of October and continuing until the following May, or even later—it only affects the Cape Colony in an epizootic form in certain years, although sporadic cases occur annually in certain localities.

"It affects horses, asses, mules, and it has been asserted—although I have never seen such cases—that quaggas have also been killed by it.

"I have recently identified a disease which occurs to a limited extent among cattle as being probably of the same nature, while a disease which occurs widely throughout the Eastern Province among high-bred goats and sheep is closely related in its pathology with this malady.

"Horse-sickness occurs mostly in low-lying part of the country, independent of the fact that the general locality may be considerably elevated above the sea-level; thus Johannesburg, which is about 6000 feet above the sea-level, is frequently subject to its baneful influence.

"Certain atmospheric conditions seem to favour the production of this disease, for it is commonly observed to occur during periods when the air has become humid and has been associated with a high daily temperature.

"Deep kloofs or gullies where vegetation is abundant and the ground, below the undergrowth, moist, are especially dangerous to susceptible animals.

"During a season of sickness it has been commonly observed that animals which are not allowed to graze after sundown nor before the sun has dried up the dew from the herbage, do not so readily become affected, but that where this routine is not carried out mortality commonly occurs.

"Horses which are kept in the stable during the night are, as a rule, safe, but during last year 60 per cent of the stabled horses in Eshowe, Zululand, died of this sickness. Veterinary Lieutenant Coley, A.V.D., who kindly made the observations for me, stated that these horses were mainly

fed on Guinea or Ubaaba grass mixed with forage or Indian corn. This grass was usually cut in the evenings and made into bundles till next day. Those who took particular care to have the grass thoroughly dried in the sun before using it did not lose their horses, while those who neglected this precaution lost heavily.

"It is only directly contagious; for, while horses may be inoculated with virulent blood and be permitted to die among clean animals, I have never found, during observations extending over seven years, a single case of infection from such a source.

"The Boers have been in the habit of sending their horses to elevated tablelands previous to the onset of the season of sickness; such areas being usually free from the disease. The onset of frost commonly puts an end to the ravages of the disease, and the first frost in a season has been usually regarded by the Boers as a sign that their horses might be recalled from their sanatoria.

"The season of sickness usually begins about the beginning of November and lasts till the following May; the worst period being from the end of December until the end of February.

"The mortality from this malady is terribly great in countries such as Rhodesia and the low-lying parts of the Transvaal, in which it makes its appearance annually. In Rhodesia the annual losses amount to 90 per cent.

"Animals which have been affected and subsequently recover are spoken of as 'salted.' They are believed to be protected against the disease for the future, and, owing to this belief, the value of a 'salted' animal is from six to ten times what it would be in an 'unsalted' condition.

"As, however, the sickness does not always present symptoms during life which admit of a satisfactory diagnosis being made, it happens that most animals which become ill during the season, from whatever cause, are believed by the farmers to have the horse-sickness, and should they recover are immediately said to be 'salted.' It will therefore be evident that many animals sold as 'salted' are not really so, and thus the report finds favour that even 'salted' horses die of the sickness.

"I have, however, had ample opportunities of ascertaining that some 'salted' horses have actually died, notably animals which, after 'salting' in one area, have been removed to a much more unhealthy one. My experiments, among other things, go to explain these occurrences.

"*Secondary Fever.*—Animals which are really 'salted' are subject at much later and irregular periods to attacks of fever. Such attacks have no relation to fresh infection, as I have found them to occur in all 'salted' horses which I have kept under close observation in the stable. The attacks vary greatly both in degree and duration; they may last for one day, or may extend over as many as six days.

"*Symptoms of Horse-Sickness.*—In the variety of the disease styled by the Dutch Dun-paardziekte, the symptoms are, for the most part, conspicuously absent until just before the onset of death. The animal may be seemingly in perfect health and vigour, yet within an hour it may suddenly begin to show that its breathing is actively interfered with: it will heave violently at the flanks, stagger about for a few moments, and falling down, eject a huge cloud of white foam from the mouth and nostrils, after which death is almost immediate. In the other variety, known as Dikkop-riekte, the neck, head, and lips swell up enormously; the latter commonly to such

an extent as to fall back and expose the teeth of the lower jaw. A sub-variety of this kind is called Blautong, owing to the swelling being mostly confined to the tongue, which then presents a bluish colour owing to the venous engorgement of the organ.

"Owing to the apparent absence of symptoms until just before the onset of death, it was commonly believed that the whole course of the disease, from the moment of infection until death, occupied only a short period. As, however, it has been found possible to carry infection from one animal to another by inoculation, the onset of fever has been found to follow the operation, only after a prolonged period of incubation.

"*Post-mortem Phenomena.*—Whichever variety of the sickness the animal may have suffered from, it is usual, although not an invariable rule, to find a huge cloud of white foam around the mouth and nostrils of the dead animal. This usually remains unchanged, to any great degree, for a long time even during exposure to a hot sun.

"If this exudation begins during life, one notices that it arises from a fluid which the animal is coughing up, and, if one stands close to an affected horse during this stage, the breath sounds are clearly audible as if passing through some fluid material which is present in the air passages, As the animal stands with head hanging down, this fluid falls from the mouth and nose spasmodically, especially during coughing. I have caught quantities of this material in glass vessels when it appears as a straw-coloured fluid, but is spontaneously coagulable, in the presence of minute traces of blood.

"It is coagulated by heat, and has been found to consist almost entirely of the blood plasma.

"On removing the skin of a horse affected with the ordinary form of the disease, one finds among the fasciæ in various situations, but particularly along the course of the jugular vein, lines of yellow almost transparent exudation, partions of which when removed present an appearance like gelatine.

"The pericardium invariably contains an excess of fluid. As a general rule, the amount present is such as to render the membrane so tense that when it is pricked with a knife the fluid contained within it is ejected with some little force. I have removed as much as 140 fluid ounces from one case, but, as a rule, the amount is under 100 ounces.

"In colour it is usually of a brilliant yellow, but in some cases it is slightly or very deeply tinged with blood, and in such cases, when examined microscopically, blood corpuscles are to be found in it.

"Even when of a brilliant yellow colour, it is liable to become coagulated very shortly after its removal from the sac, and indeed it is not uncommon to find that portions have already undergone coagulation previous to the opening of the pericardium. The parietal layer of the pericardium is usually injected and slightly opaque, but I have never recognised any true inflammatory action to be indicated.

"Extending from the base of the heart along the course of the great vessels, and involving the surrounding connective tissue, there is frequently to be found considerable amount of a characteristic yellow gelatinous exudation.

"Towards the base, on the outer surface of the heart and along the interventricular groove, these are distributed smaller or larger extravasations of blood. In size these may vary from a pin point up to one-eighth of an

inch, but as a blending of individual points commonly occurs, the discrete areas of extravasation may measure half an inch or more in diameter. This condition is not at all characteristic or peculiar to horse-sickness, as it also occurs in cases of Texas fever and rinderpest among cattle.

"The muscular substance of the heart frequently appears perfectly normal, but in some cases it is paler and somewhat cloudy.

"The endocardium is most usually somewhat opaque and in the subserous tissue, especially near the attachments near the Columnæ carneæ, extravasations of blood are very commonly found.

"In some rare cases ante-mortem clots are found in the cavities of the ventricles.

"On examining the muscular tissue microscopically, it is usually seen that the striation of the muscular fibres is obscured owing to cloudy swelling; and among the fibres in numerous directions, near to an area of extravasation, there are to be found smaller or larger extravasations of blood, which are commonly found to be undergoing degenerative change, and may include masses of blood pigment and blood crystals.

"The pleural cavity usually contains much fluid, which, like that seen in the pericardium, is either of a clear amber colour, or more or less blood-stained.

"The lungs, in horses which have been stabled and not worked during their illness, appear pale in colour, or may show patches of congestion. Close examination usually reveals the presence of a diffuse pigmentation.

"The most characteristic feature, however, is an exudation of clear yellow fluid into the interlobular tissue, which dissects the lung up in every direction, but more particularly towards the free edges. At the latter situation the clear bands of exudations may measure over half an inch in diameter, and if the lung is held up between the observer and the light, the exudation bands appear transparent and of a yellow colour.

"In other cases, where the animal has been ridden during its illness, the lungs may appear engorged with blood to such an extent as to simulate croupous pneumonia. On microscopic examination of the lung tissue one finds that exudation of lymph has taken place in all directions.

"The endothelium of the acini is swollen, and the nuclei are frequently seen to be undergoing proliferation. Among the interstitial tissue the cells are also found to be swollen and proliferating, while smaller or larger portions of blood pigment are to be seen either among or actually within the proliferating cells.

"The veins are usually distended with blood corpuscles, and, in cases of the congested variety, enormous and innumerable areas of extravasated blood are to be found.

"The spleen, as a rule, is enlarged, deeply congested, and over the whole surface may be seen small hæmorrhagic points. On section the capsule immediately retracts, and the substance is seen to be very dark in colour owing to venous engorgement.

"On microscopic examination the pulp and sinuses are distended with blood corpuscles, while innumerable extravasations of blood, now more or less altered, have led to the formation of innumerable and frequently enormous masses of pigment and blood crystals, the presence of which causes sections to be cut with great difficulty.

"The kidneys are usually slightly enlarged, and on section one may

find in the pelvis more or less of a clear gelatinous exudation. The capsule is readily separable. In some cases the medulla appears only slightly congested, and the cortex is deeper in colour than normal.

"On microscopic examination I have found evidence of irritation throughout the whole organ; the nuclei of the epithelial lining of the tubules are increased in number, as are also those of the glomeruli. In various situations the swollen epithelial cells suggests an approach to true catarrhal nephritis, but this is not a general condition.

"Judging from the condition which I have found in the lungs, one might expect to find venous congestion well marked in the kidney; but it is for the most part absent.

"It is difficult to define intertubular serous exudation in hardened preparations, but there is evidence in the form of granular débris involving the intertubular tissue, which goes to show that during life this tissue must have been the seat of an albuminous infiltration.

"The gastro-intestinal tract does not usually present any appreciable abnormality, but during the epizootic of 1892 several cases which occurred in the veld were found to have varying degrees of enteritis present. As, however, the farmers of this Colony have a considerable liking for dosing sick animals with paraffin oil, sheep-dip, and other remedies, it is more than probable that the unusual symptoms could be referred to the influence of treatment. The right side of the stomach, however, is, as pointed out by Professor M'Fadyean, commonly more or less deeply congested. The cerebro-spinal system to some extent also suffers from this serous exudation, but the only symptoms which have come under my own observation have consisted in slight flattening of the convolutions of the brain and some increase in the amount of fluid found in the fifth ventricle.

"The conjunctivæ are always injected, and the cornea is of a dusky hue; the buccal mucous membrane is not, as a rule, but the nasal mucous membrane is frequently injected. Infiltration of the same serous material also involves the epiglottis and the larynx; in one case the swollen condition of the vocal chords which arose from this exudation gave rise to a very great difficulty in breathing.

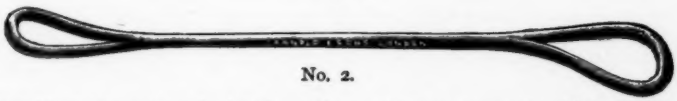
"Pathological phenomena are, therefore, for the most part to be ascribed to the marvellous exudation of blood plasma, which, while seen more or less throughout the serous and subcutaneous tissues, is best marked within the thoracic cavity. The enormous exudation into the pericardium must exert some very definite interference with cardiac action, while the pleural exudation, combined with infiltration into the interlobular pulmonary tissue and eventually into the acini themselves, furnishes physical impediments to the function of respiration.

"Throughout the course of numerous post-mortem examinations one negative feature stands out in remarkable prominence, namely, the almost total absence of any true inflammatory phenomena, while the conditions obtaining might be, for the most part, ascribed to acute venous congestion with exudation of blood plasma. This, however, cannot be considered as the primary cause of death, for, as I shall show, there is a definite toxic property associated with the contagium of this disease which seems to me to exert an action on the vaso-motor system.

TWO CANINE INSTRUMENTS.

BY FREDERICK HOBDAY, F.R.C.V.S., 27 LOWER PHILLIMORE PLACE, KENSINGTON.

No. 1.



No. 2.

THE illustrations here depicted are those of two instruments which I believe to be new, and which I have had in use for some time in certain canine cases.

Fig. 1 represents a flexible metal bladder sound, which is exceedingly useful in the diagnosis of stone in the bladder. A few months ago I had three cases of this troublesome complaint under treatment, two of which I was able to diagnose by rectal examination or with an ordinary catheter, but in the third, in order to make a positive diagnosis, a metal sound seemed necessary.

By the courtesy of Messrs. Arnold and Sons I was able to try several of the patterns in use in human surgery, but they were not satisfactory on account of the bone in the dog's penis. By the suggestion of a member of their firm, models were made of flexible wire. The one here illustrated is the outcome of these, and will be found of a convenient size for the majority of patients. After being lubricated, it can be passed readily into the bladder of either the dog or the bitch, and the presence of a stone detected by the perceptible sound or jar given when the stone is suddenly struck.

Fig. 2 represents a parturition instrument technically termed a "Vectis," the crude idea of which was suggested to me by the great help I had frequently obtained from the handle of an ordinary button or glove hook. The object to be aimed at is to pass it over the occiput or some other prominent part of the fœtus, and by firm, gentle pressure against the pelvis, or against the finger, to draw the fœtus towards the vagina. The same instrument is suitable for both large and small dogs, and is of great utility in a case of difficult labour.

The instruments are made by Messrs. Arnold and Sons, West Smithfield, E.C.

ANNUAL REPORT OF IMPERIAL BACTERIOLOGIST (GOVERNMENT OF INDIA) FOR THE YEAR 1899-1900.

A PERUSAL of this valuable Report well repays the reader. Dr. Alfred Lingard, the Director of the Imperial Bacteriological Laboratory of India at Maktesar, N.W.P., informs us that it was until lately the best equipped Institute of its kind in the East, the only one in the world probably at an elevation of 7500 feet. About twelve months ago (sad to state) by an unfortunate fire the apparatus, manuscripts, microscopical specimens, &c., the work of six anxious years, were destroyed in a few hours. We are glad to learn, however, that a Budget Grant of a liberal amount has admitted of the renovation and replacement of all the necessary apparatus for the full equipment of a scientific laboratory, and with the least possible delay.

Dr. Lingard and his assistants, notwithstanding this calamity, have carried through a large amount of good work.

"During the year under review, a large number of experiments have been carried out with a view to ascertain the merits of the different protective methods against rinderpest put forward by South African observers, and the value of such when tested in cattle of different breeds indigenous to India."

Pages of the Report are devoted to an exhaustive and satisfactory record of the serum-testing experiments, also those with the bile and the rinderpest blood.

Dr. Lingard reports as follows regarding tuberculosis :—

"As is known, tubercle in the human subject in India is of frequent occurrence in some localities, but up to the present I have not met with any veterinary officer who has ever observed tuberculosis in cattle in this country."

Among the horses and mules at the important Reserve Remount Depôts, Hapur and Karnal, a disease appeared during the year under notice, considered to be glanders farcy, and of so serious a nature that 112 horses and mules at Hapur were destroyed. After careful investigation and the use of mallein (which failed in almost all the affected cases to induce reaction) the affection was decided to be "Lymphangitis Epizootica," described by Rivolta in 1873, and "Ulceratvee Lymphangitis," described by Nocard in 1897. This Report gives it as a virulent disease, inoculable especially in equines, characterised by suppuration of the superficial lying lymphatics, and due to the presence in the tissues of a special organism the "Cryptococcus farciminosus Rivoltae," and is quite distinct from glanders. The disease develops from wounds after a period of incubation of about three months (may occupy four weeks to six months, average about three months). We are promised some further hints of the investigations into the nature and causes of diseases of the equines, such as Surra, Roorkee Disease, and it may be of others that we do not meet with in this country. Needless to remark, India provides enormous scope for the exercise of bacteriological talent.

THE PRESENCE OF ENZYMES IN NORMAL AND PATHOLOGICAL TISSUES.

BY JOHN SOUTTAR M'KENDRICK, M.D.[1]

(Read at a Meeting of the Royal Society of Edinburgh.)

THE unorganised ferments or enzymes which are present in the digestive juices have for many years occupied the attention of physiologists. Although their chemical nature is still doubtful, yet most of their physical and chemical characters are known, and there are methods by which they may be extracted from the tissues and digestive juices. They are generally believed to play the most important part in the digestive process, and within recent years physiologists and pathologists have speculated as to the existence of similar substances in other tissues, and so have endea-

[1] This is an abstract of the original paper. The research was conducted partly in the Physiological Laboratory of the Glasgow University, and partly in a laboratory of my own at home.

voured in many instances to offer a hypothetical explanation of some of the changes that occur in tissue cells themselves. During the last eighteen months I have endeavoured to ascertain the presence or absence of these enzymes in normal and pathological tissues generally. Before describing the method adopted in carrying out this research, with the enumeration of the tissues examined and the results obtained, I shall briefly refer to our present knowledge of the existence of these enzymes in tissues other than those of the digestive tract, as well as to their presence in plants.

DO ENZYMES EXIST IN OTHER TISSUES?

Zymolysis, one of the manifestations of the digestive process, occurs in plants as well as in animals. We know from the researches of Bernard[1] that digestion in plants is in most cases an interstitial one. By that term he meant the chemical changes that take place in the food stored up in the tissues for purposes of nutrition. For example, the starch that exists in the tuber of the potato undergoes conversion into sugar at one period of its growth. Many other instances could be cited, which show that an interstitial digestion is being carried on in the cell structure of the plant, presumably by enzymes of a nature identical with those that exist in the digestive juices of the animal. The zymolysis, then, of plant life is the process of conversion of stored-up food stuffs into new substances. These new substances are formed by the activity of the soluble unorganised ferments or enzymes. The zymolytic processes in plants have been investigated by Green,[2] Hansen,[3] Wortmann, and others, and it is now generally believed that in most plants there are at work enzymes of proteolytic, amylolytic, and inversive powers. The papaw plan contains a proteolytic, enzyme, papain, which is very similar in its action to trypsin, and moreover the action of the enzyme compares favourably as regards activity with those of the proteolytic ferments of animal origin.

Again, it is generally admitted that the inversion of cane sugar (as, for example, beetroot sugar into inverted sugar), during the inflorescence of the plant, is due to an inversive enzyme. Many examples could be cited which show the presence in plants of enzymes similar in their nature and action to pepsin, ptyalin, and invertin.

The question presents itself—since we are aware that in plant life a zymolytic interstitial digestion is constantly at work—is it not possible, and indeed probable, that in animal tissues as well, enzymes are in action; they may be of the same or a different nature, taking an active part in the metabolic processes occurring in the individual cell? If such were the case, it might account for the conversion of glycogen into sugar in certain circumstances—the conversion depending upon the activity of a soluble enzyme, liberated, it might be, from a parent zymogen existing in the protoplasm of the hepatic cell. Again, it might account for the abnormal sprouting of a parent tissue, depending upon the increased activity of an enzyme in that tissue. When a sarcoma or a carcinoma grows, is it not possible that an interstitial digestion is at work, altering the nutrition of the parent tissue? This might account for the greater rapidity in growth of tumours in certain tissues than in others.

[1] *Leçons sur les phénomènes de la vie*, T. 2, 1879, Paris.

[2] *Science Progress*, London, vol. i. p. 342; vol. ii. p. 109; vol. iii. pp. 68, 376; vol. v. p. 60.

[3] *Bot. Ztg.*, 1886, S. 137.

The only reference in literature which I have found bearing on this subject can be found in Halliburton[1] and Sheridan Lea's[2] books, which refer to the work of Nasse and Brücke more especially. Halliburton says, "Brücke has shown that muscle, in common with most of the tissues of the body, contains a small quantity of pepsin"; and again, "O. Nasse showed that muscle juice also contains an amylolytic ferment, which he supposes to act in the transformation of glycogen into sugar after death. I (Halliburton) have made a few experiments on this subject, and can fully confirm Nasse's statement of the existence of this ferment"; and again, he says, "We have already seen that such a ferment (diastatic ferment) can be obtained from muscle, and it seems that diastatic activity is present in all living proteids."

Sheridan Lea, when writing of ptyalin, states:—"While occurring chiefly and characteristically in saliva, a similar enzyme may be obtained in minute amount, but fairly constantly, from almost any tissue or fluid of the body, more particularly in the case of the pig."

In an article by Brücke,[3] entitled "Beitrage zur Lehre von der Verdauung," there is a paragraph at the close entitled "Die verdauende Substanz im Fleische."

This is the subject evidently referred to by Halliburton, although Brücke may have described his results more fully in other papers. He showed that the juice of flesh when treated with water, and subjected to the same ether and cholesterin process that he used in carrying out his experiments for the isolation of pepsin from the mucous membrane of the stomach, had decided digestive properties. The digestion was noticeable in from five to six hours, and in the course of the next day all fibrin had been completely digested. He confirmed his results by a slightly different method. He obtained the juice from 4 lbs. of ox beef, and treated this with phosphate of lime. The filtrate was dissolved in weak hydrochloric acid. He obtained again a fluid which dissolved pieces of fibrin in the course of the same day. The digestion was found to go on, not only at 38° C., but even in an ordinary atmosphere. This experiment proved that Brücke had at least found pepsin to be present in the juice of flesh. This flesh was mostly muscle, bnt it must have consisted as well of fat, arteries, veins, nerves, &c.

Although Brücke thus obtained pepsin fiom a large piece of flesh, and references are made to the effect that in muscle as well as in most other tissues there is a diastatic enzyme of the nature of ptyalin or amylopsin, no one, so far as I can ascertain, has methodically taken up each tissue separately and made a glycerine extract of it, to ascertain whether any particular enzyme, or enzymes, exist in the different tissues.

The experiments were carried on in an incubator with heat regulator, so that any required temperature could be maintained.

The material consisted of fresh fibrin, starch solution, solution of cane sugar, solution of 0.2 per cent. HCL, solution of 1 per cent. Na_2CO_3, and the usual chemicals employed as tests in such researches. The starch solution was freshly prepared for each set of observations. It contained 1 grm. of the best rice starch dissolved in 50 c.c. of water. The cane sugar solution contained 1 grm. of sugar in 50 c.c. of water. The fibrin was fresh, and washed in running water for at least twelve hours before use.

[1] *Text-Book of Chemical Physiology and Pathology*, pp. 412 and 549.
[2] "The Chemical Basis of the Animal Body," Foster's *Physiology*, vol. v. p. 56.
[3] *Sitzung. Akad. der Wissensch.*, Band xliii. Abth. 2 (1861).

If X be the name of the extract used, then X was divided into the following portions, and submitted to certain tests :—

1. 10 c.c. of X were added to 20 c.c. of starch solution. These two fluids were shaken in a test tube. The test tube was plugged, and placed in the incubator at a temperature of 38° C., for twenty-four hours.

   The mixture was then tested with Fehling's solution, and any reduction was noted. If there was any reduction, then the probability was that sugar had been formed, and the fluid was submitted to further tests. To 5 c.c. of the mixture were added 1 decigramme of phenyl-hydrazine hydrochloride, and 2 decigrammes of sodium acetate. The mixture was heated for half an hour, and the deposit which formed on cooling was examined microscopically for crystals of phenyl-glucusazone and phenyl-maltosazone.[1]

2. 10 c.c. of X were added to 1 grm. of fresh fibrin in beaker. The extract was diluted up to 40 c.c. of cold water. The beaker was covered with a glass lid, and placed in the incubator for twenty-four hours, at the same temperature (38° C.).

   The appearance of the fibrin was noted, and to a portion of the filtered fluid was added an equal quantity of sulphate of ammonium, and the presence or absence of a precipitate was observed,

3. 10 c.c. of X, diluted up to 40 c.c. with a 0.2 per cent. solution of hydrochloric acid, were added to 1 grm. of fibrin in beaker. The beaker was covered and placed in an incubator as before.

   The appearance of the fibrin was noted, particular attention being paid to see whether there was any appearance of digestion. The biuret test was applied to the filtered solution, and the presence or absence of a rose pink hue observed.

4. 10 c.c. of X, diluted up to 40 c.c. with a 1 per cent. solution of carbonate of soda, were added to 1 grm. of fibrin in beaker. The beaker was covered and placed in incubator as before.

   The appearance of the fibrin was noted to see whether any erosion of it had occurred. A portion of the filtered fluid was examined by the biuret reaction, while another portion was evaporated down to a few drops, and examined microscopically for crystals of leucin and tyrosin.

   On several occasions, when leucin and tyrosin were suspected, a portion of the filtered fluid was tested with Millon's reagent. The precipitate which formed was filtered off, and the filtrate evaporated down to small bulk. Any change in the colour of the solution was observed, and a few drops of the concentrated liquid were examined microscopically.

5. 10 c.c. of X were added to 20 c.c. of a solution of cane sugar. The two fluids were shaken in a test tube. The test tube was plugged, and placed, as before, in the incubator.

   The mixture was tested with Fehling, and any reduction noted. As in the case of 1, the phenyl-hydrazine test was frequently applied.

6. 10 c.c. of X were added to 50 c.c. of fresh milk diluted to 100 c.c.

[1] I may state here that on no occasion did I observe the typical crystals which occur in sheaths and bundles. I obtained frequently crystals, yellow in colour, small, and almost amorphous in character.

with water. The mixture was stirred, covered, and placed in incubator. Any special curdling of the milk was noted.

7. 10 c.c. of X were placed in a test rube, and put in incubator. The extract was then tested with Fehling's solution, and any reduction was noted.

In order to compare the results of the action on fibrin by the extract in alkaline and acid media, with the results in alkaline and acid media alone, confirmatory tests were frequently applied (the strengths of the solutions of hydrochloric acid and carbonate of soda being the same).

By means of these tests one was able to note :—

1. The conversion of starch by X into a reducing agent, and this probably by an enzyme similar in its action to ptyalin or amylopsin.
2. The change in fibrin when acted on by X in a watery solution, and the presence or absence of proteoses.
3. The change on fibrin when acted on by X in a 0·2 per cent. hydrochloric acid solution, and the presence or absence of peptones, the result of the activity of an enzyme similar to pepsin.
4. The change in fibrin when acted on by X in a 1 per cent. carbonate of soda solution, and the presence or absence of peptones, leucin, or tyrosin, the result of the activity of an enzyme similar to trypsin.
5. The inversion of cane sugar by X into a reducing sugar, and this probably by an enzyme similar in its action to inversin.
6. The curdling of milk, and this by an enzyme in its action to rennin.
7. Whether the extract itself had any reducing properties.

SOURCES OF ERROR IN THE EXPERIMENTS, AND HOW THESE WERE AVOIDED.

1. Length of time for extraction by glycerine—

We know that enzymes, when present in small amount (and they are likely to be so in the tissues), require considerable time for their extraction of glycerine. Consequently, little or no reaction might be obtained from tissues, although an enzyme was present, if the tissue were not a sufficiently long time in glycerine. To avoid this source of error, in all cases the tissues were immersed in glycerine for six weeks, and in many cases for a longer period.

2. Length of time required for enzymic action—

It is of importance to subject the solutions containing the supposed enzyme to a temperature of 38° C. for a considerable time. While enzymes may exist in the glycerine extract no reaction may be obtained, owing to a deficient exposure at the proper temperature of the mixed fluid under observation. To avoid this cause of error, I allowed the action to go on for a period of from eighteen to twenty-four hours.

3. The purity of the solutions used—

The solutions of starch and cane sugar must be fresh, and possess no reducing properties. Consequently, they must be always tested before any observation is made ; and further, these solutions must be tested after remaining in the incubator for twenty-four hours. I have found, in regard to

this latter point, that a pure starch or cane sugar solution, when submitted to a temperature not exceeding 40° C. for twenty-four hours (with the vessel or test tube in which the solution is contained plugged), should possess no reducing properties at the end of that time. Fehling's solution must be pure, and not alter in colour on boiling. With these precautions we are able to say, definitely, if the starch solution, plus X, reduces Fehling's fluid, that the extract itself has reducing properties, or that the starch has been converted into a substance that reduces Fehling's fluid. The first point is settled by testing the extract itself. If this has no reducing property, we may conclude that the starch solution has been altered by a substance which is present in X, which can reduce Fehling's fluid.

4. The presence of organisms in the tissues—

This question presents itself as we are aware that organisms and their ferments are capable of creating changes in starchy and proteid foods in a closely similar way to those caused by the unorganised ferments or enzymes that exist in the tissues. There are many chemical tests by which we may distinguish between the two classes of ferments, such as the use of peroxide of hydrogen, borax, salicyclic acid (0·1 per cent.), thymol (0·5 per cent.), carbolic acid (0·5 to 1 per cent.), chloroform, and others, yet we are compelled to admit possible results depending on the existence of an organised which may be confused with those due to an unorganised ferment. It is necessary to make sure that no organisms enter during the preparation of the tissues. There must be no putrefactive change in the tissues under investigation, or in the fibrin itself. All beakers and test tubes must be sterilised, and before submitting their contents to the action of heat they must be sealed and plugged.

The organisms themselves are killed during the process of extraction and immersion in alcohol, but we have not to consider only the organisms, as they may be capable of liberating ferments or enzymes, which will be taken up by a suitable extractive. By the use of antiseptics we avoid this difficulty.

Although I never used antiseptics (as I intended to observe the results on the tissues unaltered), I hope in a future research to compare the results I have obtained with those in which antiseptics such as thymol or salicylic acid will be used.

The only tissues where such a difficulty really arose were those of the intestines of the rabbit and child, certain of the pathological tissues, in sputum and in the post-mortem tissues. In sputum, no doubt, pyogenic organisms exist in great numbers. The post-mortem tissues were removed in less than twenty-four hours after death, and were at once placed in absolute alcohol. The other tissues were fresh, and were removed, powdered, and placed in abselute alcohol within a few hours after their removal.

In the intestines putrefactive bacteria are always present, but the greatest care was taken in stripping off the mucous membrane of the bowel, and in washing it freely in running water before mincing and placing it in alcohol. The fibrin which was used was fresh, and contained no putrefactive organisms.

I admit that no means in the way of antiseptics have been used to distinguish whether the results depended on the action of the unorganised or organised ferments; but I consider that in most cases the results have not depended upon the organised, but upon the unorganised ferments or enzymes, which play such an important part in the process of digestion.

5. The cleavage of proteids by acids alone—

Fibrin is unaltered by the action of pepsin alone, but in the presence of hydrochloric acid rapid digestion takes place. A weak solution of the acid itself has the power of causing the fibrin to swell up and become translucent, and to produce an acid albumin, or even albumoses and peptones.

Do we know, then, whether the peptones that are produced in various experiments depend upon the activity of an enzyme in conjunction with HCl, or from HCl itself?

The biuret reaction is a fairly distinctive test.

If pepsin has been at work, then a rose-pink coloration results, but, if not, a violent coloration is produced.

6. The coagulation of milk—

A certain amount of coagulation occurs from heat alone, but the coagulation which thus occurs is very different from the form of clot produced by the action of rennin.

GLYCERINE EXTRACTS WERE MADE OF THE FOLLOWING TISSUES :—

I. Tissues from the rabbit—

(*a*) Bones ; (*b*) small intestine ; (*c*) large intestine ; (*d*) blood ; (*e*) stomach ; (*f*) lungs ; (*g*) kidneys ; (*h*) liver ; (*i*) muscle ; (*j*) pancreas ; (*k*) brain ; (*l*) suprarenal bodies ; (*m*) spleen ; (*n*) heart ; (*o*) hair and skin ; (*p*) eyes.

II. Tissues from a human being (child)—

(*a*) Spinal cord ; (*b*) heart ; (*c*) muscle ; (*d*) bone (partly ossified) ; (*e*) liver ; (*f*) thyroid ; (*g*) large intestine ; (*h*) skin ; (*i*) stomach ; (*j*) vermiform appendix ; (*k*) lung ; (*l*) spleen ; (*m*) suprarenal bodies ; (*n*) brain ; (*o*) kidneys ; (*p*) small intestine ; (*q*) gall bladder ; (*r*) thymus gland ; (*s*) pancreas ; (*t*) cartilage ; (*u*) fat.

III. Tissues from a human adult[1] (not post-mortem)—

(*a*) Tendo Achilles ; (*b*) fat ; (*c*) muscle ; (*d*) cartilage ; (*e*) ligament and synovial membrane ; (*f*) bone ; (*g*) skin ; (*h*) connective tissue ; (*i*) nerve ; (*j*) placenta.

IV. Human post-mortem tissues (macroscopically and microscopically normal)—

(*a*) Liver (No. I.) ; (*b*) liver (No. II.) ; (*c*) lung ; (*d*) skin ; (*e*) large intestine ; (*f*) kidneys ; (*g*) spleen ; (*h*) muscle ; (*i*) small intestine ; (*j*) fat.

V. Glycerine extracts were made of the following pathological tissues :—

(*a*) Carcinoma of skin (infected by cancer of pylorus) ; (*b*) scirrhus of breast ; (*c*) sarcoma of face ; (*d*) angeio-sarcoma of leg ; (*e*) eclamptic tissues :—

(1) blood ; (2) liver ; (3) pancreas ; (4) spleen ; (5) brain ; (6) kidneys ; (*f*) varicose veins ; (*g*) tubercular sputum.

In my original paper tables were submitted which showed the tests applied and the results obtained, but here it will be sufficient to deal with the results in a general manner, in short, to show whether these extracts have actions similar to those of ptyalin, pepsin, trypsin, inversin, and rennin.

[1] The first nine tissues were obtained from a healthy leg, removed by operation for sarcoma of the upper end of the femur.

(*a*) WHAT IS THEIR ACTION IN THE CONVERSION OF STARCH INTO SUGAR?

I have drawn out the following table to show a comparison of results obtained in the conversion of starch into sugar by the extracts of normal tissues. I have used the terms "abundant," "considerable," "distinct," &c., to denote relatively the density of the precipitate formed by their action in the reduction of Fehling, so as to give a clue to the amount of sugar formed, thus indicating, roughly, the activity of enzyme in the tissue extract or presumably its amount :—

	I. Rabbit's Tissues.	II. Child's Tissues.	III. Human Adult Tissues.	IV. P.M. Tissues.
Abundant Conversion	Small Intestine X	...	...	Small Intestine X
	Large Intestine X	...	...	Large Intestine
	Stomach	...	...	...
	Liver X	Liver X	...	Liver (No. 2) X
	Muscle	...	Muscle	Muscle X
	Pancreas	Pancreas	Placenta	Lung
	Spleen	...	...	Spleen
Considerable Conversion	...	Lungs	...	Liver (No. 1) X
	Suprarenal bodies	Suprarenal bodies	...	...
	...	Kidneys	...	Kidneys
	...	Small Intestine	..	...
Distinct Conversion	...	Heart Muscle	..	...
	...	Large Intestine	...	...
	...	Brain	Fat X	...
	...	Thymus Gland	...	...
Slight Conversion	...	Muscle	Bone X	...
	Kidneys	Stomach	Skin X	...
	...	Vermiform Appendix	...	...
	Heart Muscle	Spleen	Connective Tissue	...
	...	Cartilage	Tendon X	...
	...	Fat X	...	Fat X
No Conversion	Bones	Bones	Cartilage	...
	Blood	Thyroid	Ligament	...
	Lungs	...	...	...
	Brain	Spinal Cord	Nerve	...
	Hair and Skin	Skin	...	Skin
	Eyes	Gall Bladder	...	...

A glance at this table shows that most of the succulent organs and tissues yield an extract which rapidly converts starch into sugar; while the drier tissues, such as bone, cartilage, &c., yield extracts which have no such power. In comparing the various tissues obtained from the rabbit, child, and adult, there is, on the whole, a similarity in their action.

Many of the tissues have an X marked opposite. These tissue extracts had the power of reducing Fehling themselves. Many tissues containing glycogen yield a sugar after their death. This fact may account for these extracts reducing Fehling, but in most cases the reduction of Fehling by the extract itself was slight as compared with the reduction by the starch solution previously acted on by the extract.

The following table shows the comparison of results obtained in the conversion of starch into sugar by the pathological tissues :—

Abundant Conversion,	Blood Liver Pancreas Spleen Brain Kidneys	Eclamptic Tissues.
Considerable Conversion,		
Distinct Conversion,	Carcinoma of Skin. Scirrhus of Breast, Angeio-sarcoma of Leg.	
Slight Conversion,	Sarcoma of Face. Varicose Veins. Tubercular Sputum.	
No Reaction,		

All the pathological extracts have the power of converting starch into sugar. Cancers and sarcomas do this markedly, while the various extracts of tissues that were examined from the patient who suffered and died from eclampsia have a very powerful action in this respect. One cannot say definitely that cancerous and sarcomatous tumours yield extracts which invariably convert starch into sugar, as a sufficient number have not been examined. The probability is, however, that this is so ; and, moreover, soft or medullary carcinomata, and soft, round, or giant-celled sarcomata will probably have a greater power in causing this conversion than the hard scirrhus cancer or spindle-celled sarcoma.

Why should the tissues in eclampsia yield extracts which have such a powerful action in the conversion of starch? It is not that they contain more glycogen, as the extract itself would have in that case reduced Fehling. Again, it is not probable that putrefactive organisms have had to do with this result, as in that case one would have expected something akin to tryptic digestion, which was always absent. Is there a special organism in this disease which has such a power, or, do the results depend upon the liberation of enzymes from the tissues in a greater abundance than exist normally? The tubercular sputum has a faint reaction in the conversion of starch. This result probably depends upon an organised ferment that is liberated after death from the pyogenic organisms which are present in such a sputum, or it may depend upon ptyalin in the saliva.

(*b*) What is their Action on Fibrin in a Watery Solution?

All tissues (normal and pathological) behave alike in yielding extracts which, with water alone, cause no change in fibrin ; and when the solution is filtered and tested with sulphate of ammonium there is no precipitate which shows the presence of proteoses.

(*c*) What is their Action on Fibrin in an Acid Solution?

All the normal and pathological tissues have the power of more or less dissolving fibrin in a 0·2 per cent. HCl solution, and of yielding a solution of peptones which give the biuret reaction.[1]

The following tissue extracts have the power of dissolving fibrin more markedly than the others :—

Rabbit.	Child.	Adult.	Post-mortem.	Pathological.
Small Intestine	Large Intestine	—	—	—
Stomach	Stomach	—	—	—
Lungs	Lungs	—	Lung	—
Liver	Liver	—	Liver	—
Muscle	Muscle.	Muscle	Muscle	—
—	—	—	—	Kidney, Pancreas } Eclamptic
—	—	—	—	

It will be seen that those tissues which have the greatest power in digesting fibrin correspond pretty closely in the different groups, and moreover correspond in great part to those tissues which yielded an extract that caused abundant conversion of starch into sugar.

(*d*) What is their Action on Fibrin in an Alkaline Solution?

The only cases in which this occurred were :—

Rabbit.	Child.	Adult.	Post-mortem.	Pathological.
Small Int.	Small Int.	—	—	—
Large Int.	Large Int.	—	Large Int.	—
Pancreas	Pancreas	—	—	Pancreas
—	Liver	—	—	—

These results open up two questions :—

(1) As the reactions are so uniformly present in the intestines, and in no other tissues except pancreas and liver, do the results depend on organisms with their liberated ferments, or on an enzyme that is present in the tissues of a nature similar to trypsin of the pancreatic juice?

(2) Is the proteolytic ferment of the pancreatic juice soluble in glycerine, provided that the results do no depend upon organism?

I do not intend to discuss these questions here. Still, with the exception of the large intestine obtained post-mortem, in which tissue organisms

[1] This result cannot be due to the conversion of proteids into albuminoses, &c. by the acid itself, as fibrin subjected to the action of 40 c.c. of 0·2 per cent. HCl alone causes it to swell up, but not to be dissolved.

are likely to be present, I do not see how the other results can depend on bacteria, as the tissues were in every instance cleansed in running water before extraction, and were absolutely fresh. The question might have been settled had antiseptics been used; consequently, I am unable to oppose the views of Kuhne,[1] and his school, or to agree with those of Hufner, but I think it probable that even with the use of antiseptics the same results would have probably occurred.

With regard to the second question, there is not the slightest doubt that the glycerine which was used extracted a small quantity of trypsin, as the extract of the pancreas dissolved fibrin with the formation of peptones and crystals of leucin and tyrosin. Glycerine, however, extracts trypsin in small amount, and the solution obtained when placed with fibrin produces only a small quantity of peptones, and rarely crystals of leucin and tyrosin. To obtain a small solution of trypsin one wonld have to adopt another method for its extraction, or to use a very watery solution of glycerine.

I do not think that it is at all likely that trypsin exists in many of the tissues, and the probability is that the proteolytic enzyme of the tissues is one which is similar in nature to pepsin.

(*e*) What is their Action in the Inversion of Cane Sugar into Dextrose?

The only tissues where there appeared to be inversion were :—

Rabbit.	Child.	Adult.	Post-mortem.	Pathological.
Liver X	Liver X	—	Liver No. I. X	—
—	—	—	Liver No. II. X	—
Pancreas	—	—	Lung X	—
—	Fat X	Fat X	Fat X	—
—	—	Bone X	L. Intestine X	—
—	—	Connective Tissue X	Muscle X	—
—	—	Tendon X	S. Intestine X	—
—	—	—	—	Sarcoma of face
—	—	—	—	Tubercular sputum

In most cases, then, the extract itself reduced Fehling and in almost all cases the reduction of Fehling depended on the extract, and not on an inversive ferment.

The extract of the pancreas of the rabbit, however, undoubtedly caused inversion of the cane sugar. This is strange, as the pancreas is not supposed to contain an invertive ferment. In no case did I obtain reactions proving the presence of *inversin* in the intestines.

The tubercular sputum rapidly inverted cane sugar, an action due probably to an organised ferment. The result is similar to that obtained from yeast. When the yeast is killed an organised ferment is liberated, which may be extracted by glycerine, and which inverts cane sugar into dextrose, as in the present instance.

[1] *Lehrb. d. Physiol. chem.*, 1868, S. 120.

(*f*) What is their Action in the Coagulation of Milk?

The only extracts which caused the coagulation of milk were:—

Rabbit.	Child.	Adult.	Post-mortem.	Pathological.
Stomach	Stomach	Placenta	—	—
Liver	—	—	Livers I. and II.	—
Pancreas	Pancrease	—	Lung	Pancrease (Eclamptic)
—	Large Int.	—	—	—

I shall now enumerate some of the more interesting results:—

I.—Extracts of the Intestines.

Paschutin[1] has proved that inversion can be obtained more effectively from the mucous membrane of the intestine than from the juice itself.

I, in no instance, obtained a reaction showing the presence of inversin in the intestines of the rabbit or child.

Is it possible that such an enzyme is not present in rabbit or child's intestines; or again, is it possible that glycerine failed to extract the enzyme inversin? Again, all the intestines examined yielded extracts which, with 0·2 per cent. HCl, had a marked action on fibrin. The same extracts had no action, or only doubtful action, in alkaline solutions. If we lay aside the actions of organisms, which, if they had been present, would have caused digestion of fibrin in alkaline solutions, we have to conclude that the digestion is due to a ferment of the nature of pepsin which acts in an acid medium.

Is it not probable, then, that a proteolytic ferment is secreted by the intestinal mucous membrane which is related closely to pepsin?

Of course, in physiological conditions, pepsin would not exert its influence in the process of digestion, as the intestinal juice is alkaline.

We know that a juice is secreted from the upper part of the duodenum which contains pepsin. I think it probable that such an enzyme may exist along the whole intestinal mucous tract.

Again, it is easy to obtain, by glycerine extraction, the enzyme corresponding to ptyalin or amylopsin. In all cases this enzyme was extremely active. It is possible that in the child there is more use for this enzyme than in adults, as ptyalin of the saliva and amylopsin of the pancreatic juice may not be present in sufficient abundance at such an early age, while in the case of the rabbit there is a greater necessity for such a ferment, as the diet contains so much starch.

II. Extracts of the Stomach.

Glycerine extracts of the stomach of both rabbit and child not only gave reactions showing presence of pepsin and rennin, but also ptyalin or amylopsin. The conversion of starch into sugar in both these cases was very marked. I have not noticed in any text-book mention of ptyalin having been obtained by extraction of the mucous membrane of the

[1] *Archiv. f. Anat.* v. *Physiol.*, 1871, pp. 305-384.

stomach. This also may be a peculiarity of the stomach of the rabbit and that of the child, but it will be important in future to see what effect a glycerine extract of a well-washed mucous membrane of an adult stomach has upon starch.

III. Extract of Rabbit's Lung.

A very interesting result was obtained from the extract of the rabbit's lung. With 40 c.c. of 0·2 per cent. HCl, the extract caused 1 grm. of fibrin to become totally dissolved in a short time. The same result, althouge in a manner less marked, was obtained from the extract of the child's lung.

It seems strange that the lung of the rabbit should possess this power so markedly. Fibrin was digested by the extract of the lung as completely as by the extract of the stomach. Does the lung then contain pepsin in almost as active a form as it exists in the stomach? The significance of this result is not apparent.

IV. Extracts of the Pancreas.

Glycerine extract of the pancreas of rabbit and child, and also of the pancreas from the eclamptic case, gave reactions which showed the presence of pepsin in considerable amount. The fibrin was always totally dissolved in the acid solution. Does the pancreas then also contain pepsin? The pancreatic juice destroys the action of pepsin, as it is alkaline; and, consequently, even though pepsin be present, it has no influence on the digestion of food stuffs in the intestines. Still, it may be present in the pancreas all the same, and only exert its influence in certain forms of disease, or possibly when the intestinal juice becomes acid.

V. Extracts of the Liver.

Glycerine extracts of the liver invariably reduce Fehling, probably from the conversion of glycogen into a reducing sugar. In all cases, however, the reduction obtained by the starch solution, previously acted upon by the extract, was greater than that from the extract itself. It would appear that in the liver there is present an enzyme that corresponds to ptyalin.

There is also present an enzyme that corresponds to pepsin. In two instances, viz., liver of rabbit and human liver post-mortem, there was curdling of milk, produced by the action of the extract. In no cases was there a reaction suggesting tryptic activity.

VI. Extracts of Blood.

A glycerine extract of the blood of the rabbit, physiologically normal, had no reaction in the conversion of starch into sugar. On the other hand, the extract obtained from the blood of the eclamptic very rapidly converted starch into sugar.

VII. Extracts of Eclamptic Tissues.

All the extracts obtained from the tissues of the eclamptic had the power of converting starch into sugar very markedly, and also of partially digesting fibrin, while, with the exception of the pancreas, they had no

action in alkaline solutions. These reactions must depend upon an altered condition of tissues in this disease, producing a greater quantity of active enzymes.

VIII. Extract of Tubercular Sputum.

It is interesting to note that a glycerine extract of tubercular sputum has a marked inversive action. It has a faint power in the conversion of starch into sugar (probably from ptyalin in saliva), and in the digestion of fibrin in an acid medium. Both these reactions are slight, as compared with the inversive power. As I have mentioned before, the result is probably due to the liberation of an organised ferment from the pyogenic or other organisms which exist in sputum after their death.

IX. Extracts of Malignant Tumours.

The few carcinomata and sarcomata that were examined yielded extracts which converted starch into sugar, and also which digested fibrin slightly in an acid medium.

Do the above Results depend then on the activity of Enzymes?

This problem naturally presents itself, but I fail to see how any other explanation would account for the results. The glycerine extract itself has no reaction on starch or fibrin unless heated to the proper temperature, and kept at this temperature for a sufficient length of time. The extract must be treated in exactly the same manner as a solution containing a pure enzyme. In all respects there is proof that when a reaction occurred it depended upon enzymic activity. When starch was converted into sugar, this depended upon the enzyme ptyalin or amylopsin, or a similar enzyme. When fibrin was dissolved, and peptones were formed in an acid solution, then the enzyme pepsin was at work: or, again, when fibrin was dissolved, and peptones were formed in an alkaline solution, then trypsin was in action. When cane sugar was inverted into dextrose, this depended upon the enzyme inversin or a similar enzyme; and lastly, when the milk curdled, an enzyme similar in its action with rennin was at work.[1]

To go a step farther, it is probable that enzymes do not exist in the tissues as such, but in their parent zymogens, the enzymes being set free by a suitable extractive and in suitable media.

Summary.

In the foregoing paper I have mentioned how the experiments were performed, and how certain difficulties which might lead to fallacies could be prevented. I traced the connection between enzymic activity of plant and animal life, showing that probably in the animal as well as in the plant an interstitial digestion was constantly at work. Although our knowledge of this question is still doubtful and obscure, one hopes that with the advancement of chemico-physiological science such a result may be confirmed, and may throw fresh light on the pathology of many obscure diseases. I then described the results of experiments on upwards of sixty extracts obtained by the glycerine process from the tissues of the rabbit, child, and the adult, both before and after death. Tables were next given

[1] In my original paper, I have discussed the questions more fully.

of extracts of organs obtained in disease, and of tumours (sarcomata and carcinomata) and tubercular sputum. My results showed :—

(1) The presence of pepsin, or a substance analogous to it, in all the tissues, normal and pathological.
(2) The presence of a diastatic ferment in the larger proportion of the tissues examined—probably of the nature of ptyalin.
(3) The absence of trypsin in the tissues, except in the pancreas. Reactions which may have depended upon trypsin occurred in the intestines and in certain of the organs obtained post-mortem.
(4) That tissues which normally contained much glycogen formed an extract which reduced Fehling.
(5) That pepsin is present to a marked extent in the lung and liver of the rabbit as well as in the stomach.
(6) That the intestines contained a proteolytic ferment of the nature of pepsin. This result differs from that of most authorities.
(7) That an inversive ferment was not obtained by the glycerine process of extraction from the intestines of the child or rabbit.
(8) That an inversive ferment was rarely present in the tissues. It was distinctly present in the extract of tubercular sputum.
(9) That a milk ferment, apart from those tissues in which it is known to exist, was rarely present.
(10) That the cancerous and sarcomatous tissues which were examined had proteolytic and distinctly diastatic properties.
(11) That rabbit's blood contained no diastatic enzyme, whereas eclamptic blood did.
(12) That all the tissues from the case of eclampsia yielded extracts which had marked diastatic properties, although these themselves did not reduce Fehling.

In conclusion, I may add that only a limited number of tissues have been examined, and that, before any final conclusions can be made as to the wide distribution of pepsin and ptyalin or amylopsin in physiological and pathological tissues, it would be necessary to examine similar tissues of many animals of the same and different species to see if all behave alike.

I cannot but entertain the hope that the examination of the blood in obscure diseases, and of carcinomatous and sarcomatous growths (with a view of ascertaining the presence or absence of enzymes), may throw light on the pathology and ætiology of certain diseases and morbid growths.

Clinical Papers.

AZOTURIA.

BY JAMES M'PHAIL, M.R.C.V.S.

THERE are generally a number of cases of this pathological condition following a continuance of rain for some time, such as we have been having, owing to the forage being sodden and the animals having to stand up, as they are unable to work the soft, sloppy, ground.

I have seen four cases in a week of this disease, and a short note on

them may not be unacceptable, as there seems to be a scarcity of cases of interest or practitioners are too busy to record them.

Case No. I.—Farm horse, lying on the road, evidently greatly distressed, body cold, patches of sweat, running pulse, hind legs protruding backwards in a manner which once seen is not forgotten, muscles of the hind quarters hard and firm, inability to rise, and evincing no desire to do so.

Luckily this case occurred near a farmstead, and a float being secured, the animal was removed to a straw shed, hauled in and made comfortable, being covered up with straw and sheets.

It was then back-raked, and the fæces were rather hard, the bladder was much distended, manual pressure on it gave no result; a drink was then given:—

℞ Ol. Lini, ℥xx.
Chlorodyne, ℥ijs.
8 pts. æth. nit. ℥iij.
M. ft. haustus.

Returned again in an hour, bringing a male catheter, animal not much improved and struggling a good bit. Removed the urine, which was very dark and tarry-looking, and gave another drink similar to foregoing but with only a third of the oil, bringing up the quantity by producing an emulsion with soda bicarb. and water. Remained in attendance about an hour, animal evidently much relieved by the removal of the urine. Left another stimulant and anodyne drink, and to call in the morning. Seen early the next day; the animal had spent a quiet night, but the owner had given the animal the drink to make sure. It was standing on its feet, but rather stiff, yet seemed otherwise all right; as the bowels had not moved, gave ℥viij aloes ball and told them to walk the horse home in the afternoon and give mashes; also gave them a drink for safety. Saw the animal next day; medicine acting, horse looking fairly well, walking better; removed urine by manual pressure and it was almost normal, so left following powders:—

℞ Pulv. Columbæ,
„ Gentianæ,
„ Luigeberis,
„ Sodæ bicarb. } *aa*℥i.
M. ft. nitte xij. bis. die.

This animal did all right.

Case No. II.—Farmer's mare, used for going in gig and milk-van; had been standing up, and then taken out in a hurry. It left the stead quite cheerfully, but had not gone far when it began to manifest an irregular gait; this got rapidly worse, lameness being quite apparent in the near hind leg; animal now began to sweat and stumble, and showed colicky symptoms.

The owners drove slowly and carefully into town. When the animal was brought into a loose-box, she tumbled down and did not endeavour to get up; back-raked, she showed marked constipation and bladder full; passed catheter and dark-coloured urine came.

Treatment.—Gave aloes ball ℥vij in addition to a stimulant and anodyne drink, and covered her up with straw and sheets. As regards restlessness this case did not cause much trouble, as with the medicine acting the symptoms passed away. But she never regained the use of the hind leg and remained a cripple; everything was tried, absorbents, nerve tonics, injections of strychnine, massage, electricity, swimming blisters, but no good resulted, the animal had to be turned out and ulti-

mately destroyed. In this case there must have been some congestion and permanent exudation on some of the nerves.

Case No. III.—Of interest only from the fact that it occurred in a stable, which is rather rare. On arrival the animal was down, in rather a narrow stall, and had the typical protrusion of the hind legs; constipated, and urine very dark on removal.

Treatment.—Gave ʒviij aloes ball, ʒjs calomel, along with an anodyne drink, and covered up and kept warm. Came back in four hours; animal better, and as I had brought slings, had the horse lifted, and though it staggered it remained on its feet. The case recovered satisfactorily, subsequent treatment by powders similar to Case No. I.

Case No. IV.—On arrival found a fine young lorry horse down in the street, showing all the symptoms of the disease, unable to rise but struggling desperately to do so, and bashing its head on the causeway, it was surrounded by the usual crowd of intelligent idiots, all giving advice and interfering. As the animal was hashing its head, I got a bag of straw shoved under its head to protect it from its own violence, and sent for a float. I then removed the urine, to the delight of the onlookers, one of whom declared the animal had burst a blood-vessel. I also gave an injection of morphia to soothe the pain in some degree.

Two hay-carts passing, I asked them to stop and they unyoked their horses; we then tilted the carts against the prostrate animal, passed ropes under it, then over the bodies of the carts and tied them to the trams, and with the assistance of the ever-willing crowd depressed the shafts to the ground, and so got the animal on its feet, and kept it so till the arrival of the float, into which it just managed to stagger and then collapse again; happily it lay still. It was then removed to a comfortable loose-box and given a stimulant and anodyne draught; as the animal was not much constipated, I only gave in addition an oily laxative, and covered it up with straw and sheets, and looked for good results.

Unfortunately this case went badly from the first; inability to use the hind legs, continued cramp of that region and fierce struggling did not help matters, and though everything was done for its benefit which could be thought of, the animal succumbed the following evening.

Autopsy.—Contents of the bowels—full but soft.

Kidneys.—Severe congestion, soft, friable, bled profusely on section.

Liver.—Congested and engorged with blood.

Nerves in posterior region.—Congestion of their coverings.

The bladder.—Contained no urine, neither could any be drawn a few hours before death, so the functions of the organs must have been stopped.

TUBERCULAR ARTHRITIS.

BY GEORGE CRAIK, M.R.C.V.S., ALNWICK.

CALLED to see recently calved cow, newly purchased, about six years old. Lame off hind fetlock; great difficulty in placing weight on it; and much swelling present. Advised laxative diet, to be placed in comfortable box, and fomentations applied thrice a day, followed by ammonia and camphor liniment. Saw it again in a week; no improvement, applied a plaster

charge. In four or five days lameness greatly diminished, animal able to walk about freely although slightly lame. On my visit on this occasion was applying annual tuberculin test to owners' cows, who has each animal tested once a year. This animal, now having good appetite and normal temperature, was subjected to test. Reaction took place, temperature rising 4° F. Breathing greatly accelerated, and animal off her food. Cow destroyed, and a diligent search made for tubercle. Lungs emphysematous, but no tubercles could be found; liver healthy, in fact all the other organs normal, with the exception of a few mesenteric lymphatic glands enlarged, and one caseous, in fact nearly calcareous. At the seat of lameness, however, tarsal bone enlarged, red and inflamed at the distal extremity, and on cutting through skin on inside of fetlock, just where the flexor tendons go through the groove, a (*beautiful*) soft tuberculous nodule was found.

I might mention that after purchase the cow was walked 12 miles over a moor, apparently sound, and the lameness was only noticed a few days after being turned out in the field with the other cows of the herd.

The case was treated as a sprain, and shows how we can be misled, and how insidious is this tuberculous disease.

Extracts.

M. LIGNIERES ON CLASSIFICATION OF HÆMORRHAGIC SEPTICEMIAS.

BUBONIC PLAGUE IN MAN.

BUBONIC plague is a disease belonging to the group of hæmorrhagic septicemias; its microbe, discovered by Yersin, is a bacterium which naturally affects rats and mice. It is hence interesting to study in its relations with the group of Pasteurella. During my stay in the Argentine Repnblic the plague appeared in Paraguay and in Argentina's two most important towns, Rosairio and Buenos Ayres. I have had at my disposal a score of plague bacilli from either sick persons or rats or mice. I intend publishing later all my observations, especially those regarding serotherapia, the efficacy of which has been quite remarkable. I will here give only a concise account of the characteristics of the microbe and of its cultural and virulent properties.

Morphology.—Yersin's microbe is a small bacillus, sometimes very slender in bouillons, in solid media it seems more short and squat. It is extremely polymorphous, and may present the most curious forms of involution. It does not possess movements of locomotion and does not form spores. It takes on aniline colouring matters pretty easily, though in old cultures the microbe is pretty difficult to colour. In the ganglia it shows that clear-space aspect which characterises fowl-cholera. It never resists Gramm.

Cultures.—Bouillon peptone, develops freely on the surface; haytea, very slight culture; urine, little or no culture; indol, in pancreatic bouillon I have never noticed it; milk, not very plentiful; gelatine, is never liquefied; gelose, quite plentiful; gelose-serum, preferable to ordinary gelose, sets up abundant culture after twenty-four hours; Würtz's gelose; the plague bacillus does not ferment lactose; coagulated serum, after twenty-

four hours a slight layer develops which does not get very thick, and grows white as it grows older; potato, generally no culture, void; no culture in bouillon-peptone, even if sowing is broadcast; with bouillon serum, a very slight culture. Cultures made with products of human plague, of plague of rats, or experimental animals, ought not to be put on the stove at 37–38°, unless one wishes to run the risk of a check. Between 15–20° cultures are at the same time more sure and more plentiful.

Inoculations.—I have so far confined myself to experiments on small laboratory animals—rat, mouse, rabbit, guinea-pig, and pigeon. Inoculations were subcutaneous, intravenous, and intra-peritoneal. Death nearly always supervenes well within a week at most, and autopsy shows hypertrophied and hæmorrhagic ganglia, infiltration of the conjunctiva, generally with congestion of the principal organs, with flecks of blood on the lungs. Finally, the morphological and cultural characteristics of Yersin's bacillus; besides, a great number of its pathogenic peculiarities clearly points to its being a Pasteurellosis.

The further I advance in the study of the Pasteurelloses, the more I am convinced of the possibility of obtaining a useful vaccine. We must not, it is clear, demand of this vaccine a preventive action comparable to that of Jenner's for small-pox or Pasteur's for anthrax, since the Pasteurellæ give us only a relative immunity. But to me this immunity seems capable of diminishing in a marked degree the ordinary mortality. This is the practical end at which I aim. Though my efforts have been slightly less directed towards serotherapy, I have nevertheless made subjects of experiment horses destined to furnish serums against equine, ovine, bovine, and aviary Pasteurellæ. I am also trying to produce a polyvalent serum for all the Pasteurellæ. Even now, I may confirm anew what I previously wrote; the Pasteurellæ furnish a preventive and even a curative specific serum, but up to the present we are still pretty far off having obtained a serum of great activity. There will be no little difficulty in getting it owing to accidents taking place in animals destined to produce these serums.—(Abridged from *Recueil de Méd. Vét.*)

REMARKS ON MEAT INSPECTION.

As regards the action of cold on the vitality of parasites, it is of little importance, for it has been noticed that trichinæ resist refrigeration even for months. As to salting, its effects are various, and Colin's experiments show us that when salting has been effected, after six, eight, or ten days the trichinæ are alive, and even disposed to develop in the intestine. Complete salting promptly kills the trichinæ in the superficial portions of the pieces of meat when these are placed in brine or sprinkled with salt; but all the same leaves for a long time alive the trichinæ which are in parts only gradually permeated with salt. In parts of middling depth, however, the parasite does not resist salting. The same thing takes place at the end of two months round about the bones, or in the parts less saturated with salt; but in the deep parts, in hams of large size which have not been long in salt, there exist live trichinæ, and these do not die for weeks, even months, varying according to the size of the pieces and the quantity of salt which has penetrated them. Various experimentalists in France, Germany, and Italy have not succeeded in developing trichinosis in animals which they have fed for a certain time with salted and trichinous flesh from N.

America; others, like Neumann, Chatin, and Bouley, have succeeded in infecting mice and rabbits with trichinous flesh from the same country. Consequently, salting does not always kill the trichinæ; hence it is that the epidemics which its consumption has caused are few and likewise mild. Smoking would have destructive effects equal or even superior to salting, but it ought to take place on a high temperature. Its effects would depend on the pyrogenetic products impregnating the meat, and the temperature oscillating between 60°-65° in the smokings. As this method is in its turn frequently combined with salting, fear of the trichinæ remaining alive is very limited. Cold smoke may likewise produce a good result, but greater time is necessary.

Prophylaxy of Trichinosis of the Pig.—To combat trichinosis it is necessary that alimentation, continually supervised, should contain none other than vegetable substances. When it is necessary to make entrails or remains of animals part of their food, these ought to be first subjected to thorough cooking. They ought to be kept in sufficiently clean places, taking care that the dead bodies of small rodents be not within their reach. Another needful thing is destruction by cremation of the dead bodies of trichinous pigs, as likewise of the mice and other vermin in the piggeries, and the prohibition of rearing or wintering a pig in slaughter-houses or tripe establishments. In the United States trichina of the pig has acquired the large proportions which are well known, by reason of the fact that in their feeding are found combined the most favourable conditions. All useless organic materials are appropriated for their food; this is what made Rœper say that the abattoirs of N. America are veritable hot-beds of the trichina.

Prophylaxy of Human Trichinosis.—We have seen before in speaking of the vitality of the trichina that it does not resist cooking, according to the methods of Fjord, of Copenhagen; the use of cooked flesh of the pig does not therefore entail danger on man. But in countries where trichinosis is endemic, and preparations of sausages in which the meat is raw or but little cooked form a great proportion of the quantity consumed, microscopic inspection of pig's flesh is indispensable. In Germany this service numbers many members, about 20,000 inspectors, organised in grades and regulated in the most minute details. N. America and European States like Denmark and Sweden have their staff of inspectors. In all these countries investigations for the trichina always limit themselves to identifying the muscular trichina in swine which are killed for immediate consumption or for products of the sausage factories. In the abattoirs of Buenos Ayres the procedure followed is most adequate and is safely based on a certain prophylactic method which deserves imitation; but not all that our population consume is thus guaranteed, since a great part is brought in from the provinces without proper microscopic examination, as likewise from outside the country. Countries which import flesh and preparations of swine, like Germany, France, &c., have established a body of inspectors of swine's flesh in their frontier posts. The instructions of the Minister of Agriculture in France to inspectors guarantee the wholesomeness of salt meat of America origin. These instructions consist in the non-admission of salt flesh which has not been fully cured. All boxes must be opened and all pieces successively subjected to inspection; appearance, consistence, and special odour revealed by the probe supply general indications. Every piece suspected of damage or incomplete salting must be cut up and subjected to microscopic examination; if it contains trichinæ it

must be rejected and destroyed. For meat in barrels examination is directed to the brine, and when this is defective as regards taste and smell, and when the areometer does not show 18° it is considered that the meat has been incompletely salted, which will entail condemnation of the whole cask.

As to the procedure prevalent in our abattoir for investigation of trichinæ in swine, like that of Germany, it consists in collecting in small boxes, all numbered, pieces of swine's flesh likewise numbered (so as to correspond with that of the box), taken from diaphragm, larynx, tongue, intercostals, and large muscles of the neck, but principally from the first named, one of the favourite haunts of the trichina. With small curved scissors sections are made in the direction of the fibres of particles of muscles sufficiently fine, and are placed between two sheets of glass or compressors with twenty-four divisions, twelve on either side of the sheet. The object of these compressors is to stretch out, by means of pressure effectuated by two screws placed at the extremities, the small muscular sections which, as they become extended between the two plates, become almost transparent. After this follows microscopic examination of the preparations one by one, each division of the compressor corresponding to a preparation, and each compressor numbered and examined corresponding in its turn to a slaughtered pig. The discovery of a single or various cysts is sufficient for condemnation of the pig, the fat melted at a high temperature being the only thing which is allowed to be utilised. Conjointly with this microscopic examination an ocular inspection of the muscular fragments contained in the boxes is made. This examination, when lengthy and made by experienced men, produces excellent results, it being possible to prove the existence of the trichinous cysts with clearness, these appearing as small whitish spots, scarcely visible, and with a certain leaden aspect in those recently encysted; but in many cases calcareous degeneration is observed, and then they are easily to be seen. In microscopic examination it is quite possible to take for trichinous cysts the Sarcoptis Músches, which is very frequent in pig's flesh. These are, however, differentiated by their lengthened and slender form. Under the microscope the difference is complete; destitute of capsule and of dark granular mass, they produce no alteration in the construction of the neighbouring muscular fibres. The encysted trichinæ must not be confused with small rolled-up muscular fibres, with nervous or tendinous fibres, or with intra-musular neo-formations. Among these we meet with the concretions to be observed in smoked or salted meat; some are constituted by tyrocina, others by guanina, presenting themselves as grey-whitish corpuscles of the size of a grain of millet, and more circular and hard; calcified cysticerci and other miliary neoplasiæ assume the same aspect. All these products, however, differ from the trichinous cysts in size, form, and absence of internal parasite. At other times we encounter in swine's flesh actinomycosis musculorum suis, fungi which look like a dark white, yellowish, and likewise calcified point. Its consistent circular masses are greater than trichinous cysts, and when flattened out they are seen to consist of filaments increasing in mass to their free extremity, which is very restringent. The cysts of distoma found in the diaphragm and muscles of the larynx might be taken for trichinæ, but their greater size and the parasite which they enclose with its ovoid form and two suckers differentiate them likewise.

(Dr. Zabola in *La Revista Veterinaria*, Buenos Ayres.)

ATROPHY OF THE ISCHIO TIBIALIS INTERNUS (SEMIMEMBRANOUS) MUSCLE SUPERVENING AFTER CASTRATION.

BY M. J. MONSARRAT, GOVT. V.S. DEPT. DU NORD, FRANCE.

LAST January I castrated a two-year-old colt, throwing him on the left side on a straw bed in the ordinary manner. There was a certain amount of difficulty in drawing the right hind limb forward, as the colt refused to bend the hock. The operation was performed with caustic clams, and the tail docked at the same time. The animal was down for twenty minutes at the outside.

The clams were removed on the fifth day, and the wounds cicatrized on the fifteenth, without any swelling or complication.

About two months afterwards the owner called my attention to the great wasting of the posteo-internal aspect of the right thigh, commencing at the point of the ischium, and extending downwards for about 10 to 12 inches, and which could be clearly seen to be atrophy of the ischio tibialis internus muscle.

I attribute this to compression of the ischio muscular (posterior gluteal) nerve, and also possibly of the femoro-popliteal artery, due to the abnormal extension of the right hind limb. I advised the owner to have the colt exercised and be given liberty. The case has done well, and is steadily improving, for although not quite recovered, the difference can only be detected by comparing one thigh with the other. I have never had an accident of this sort before, and it has struck me that when possible it would be safer to throw the animal in hobbles, place him on his back with all four limbs up in the air, and operate in this position so as to avoid the compression mentioned.

(From *Recueil de Médécine Vèterinaire*, Dec. 14th, 1900.)

JOSHUA A. NUNN,
Dec. 19th, 1900. *Vety. Lt. Colonel.*

Reviews.

THE VETERINARY PRACTITIONER'S FORMULARY, containing nearly 1500 Formulæ, and edited in accordance with the most recent Therapeutic Methods by PAUL CAGNY, Member of the Central Society of Veterinary Surgeons. Third Edition. One Vol. 18mo., 348 pages, pasteboard covers. 3 francs. Paris: J. B. Baillière & Fils.

IN editing the above, M. Cagny has set before him two different objects, viz.—(*1st*) to present to veterinarians a summary of therapeutic principles based on the modifications introduced in recent years into medical theories. As methods must follow theories in their changes, the time was deemed opportune for the publication of a Veterinary Formulary not inspired by theories considered nowadays erroneous. (*2d.*) To combine under one heading all the formulæ applicable to the diseases of a given organ. The classification here adopted will spare the reader the trouble of searching through the volume in order to find the medicament applicable, say, to a case of pneumonia or enteritis.

A therapeutic "Memorial," thoroughly exhaustive, will enable the reader to hunt up the disease and consequently the treatment applicable to it, or, on the other hand, the medicament and consequently the disease to which it is applicable. The twenty-four chapters of the Formulary are

thus headed :—General therapeutics ; pharmacology and posology ; modificators of the external cause of the disease (antiseptics and parasiticides), of the digestive apparatus, of nutrition, of the blood, of the circulaitng apparatus and of the circulation, of the respiratory apparatus, of the nervous system, of the organs of vision, of the skin, of the mammellæ and the lacteal secretion, of the urinary apparatus, of the genital organs ; therapeutic agents without special functional action (electricity, hydrotherapy, exercise and massage, caustics, astringents, emollients, adhesive mixtures) ; antidotes and counter poisons ; antivirulent medicaments ; therapeutics of animals intended for the butcher, of race-horses, of females, of animals which have been operated on ; contagious virus employed for the destruction of noxious animals ; toxines employed for the diagnosis of contagious diseases ; diseases and their medical treatment.

To supplement his own personal knowledge, M. Cagny has consulted the works of the Professors in the Veterinary Colleges at Alfort, Lyons, and Toulouse, as well as the works of foreign teachers, and in addition the writings of practitioners in France and abroad.

THE best spent shilling of the season is the one spent on purchasing the LIVE STOCK JOURNAL ALMANAC, published by Messrs. Vinton & Co., 9 New Bridge Street, London. It is full of interesting matter. It contains fifty special articles and numerous illustrations of noted specimens of the leading varieties of domesticated animals. There are also carefully compiled breeders' tables, lists of societies, fairs, statistics, &c. The volume, including the attractively arranged breeders' announcements and breeders' directory, extends to 340 pages. The opening article, with accompanying engraving, relates to a famous Hackney mare, which established great celebrity for trotting towards the close of the last century. Mr. W. T. Trench in a readable paper advocates the claim of "Hunter Sires for Breeding Light Horses." Under the title "Army Horses Abroad" Sir Walter Gilbey, Bart., gives an interesting account of the types of military horses shown at the International Show at Paris, and proves how successfully foreign breeders have introduced English blood in order to secure the objects they have had in view. Mr. P. A. Muntz, M.P., has a sensible and pithy article on the "Demand for Heavy Horses and how to meet it." "The Rate of Growth in the Horse" is a subject dealt with in a most informing manner by Professor Cossar Ewart, and his elaborate paper is sure to be read with interest. Mr. C. Stein offers many valuable hints as to "Military Stables and Stable Management." Sir Richard D. Green Price, Bart., also touches on a question of the day in his contribution on "The Pony: Its Breeding for Army Purposes." "The Value of Local and County Shows" is ably handled by Lord Middleton. Mr. W. B. Tegetmeier discusses the question of "The Supposed Influence of a First Sire," and gives another blow to the belief in telegony. A pleasantly written paper is that by Professor Sheldon on "Features of Summer Grazing." Mr. Robert Bruce traces the improvement in "Our Breeds of Beef Cattle," and Mr. Primrose M'Connell describes the "Management of a Milking Herd." Among the eontributors of papers on the various breeds may be mentioned the following :—Messrs. John Thornton, A. C. Beck, H. F. Euren, W. C. A. Blew, Wm. Scarth Dixon, C. B. Pitman, John Hill, Wm. King, R. M'Intyre, Jonas M. Webb, E. Prentice, Wm. Hooper, Rev. Dr. Gillespie, A. Mansell, S. H. Druce, R. Henderson, James Cameron, W. A. Brown, J. O. Trotter, &c.

HORSES PAST AND PRESENT. By Sir WALTER GILBEY, BART.

Is a most interesting book, and should be read by every one who desires to know about British horses from 1066 up to to-day. Not only does Sir Walter tell us about our horses, but he also tells us how in many respects they have deteriorated, and why such has occurred.

He also tells us about the founding of the Royal Veterinary College in 1791, and the abolition of quackery. We wish it had been true.

The little work is well got up, as is the wont of Messrs. Vinton & Co. and the illustrations are most excellent.

Notes.

AT their December meeting the members of the Farmers' Club discussed a paper on swine fever read by Professor J. Wortley Axe. Subsequently, on the motion of Mr. Clare Sewell Read, it was resolved that "the Farmers' Club hopes that the Board of Agriculture will persevere in the slaughter, not only of all pigs suffering from swine fever, but also of all pigs that have been in contact with them; and they would respectfully urge the Board of Agriculture to employ some veterinary surgeons in the administration of the order."—*Times.*

THE JOURNAL OF HYGIENE.—Arrangements have been made for the issue by the Cambridge University Press of a journal devoted to the publication of the best original work on Hygiene.

The journal will be entitled *The Journal of Hygiene*, and will be issued quarterly, the parts constituting one annual volume of about 500 pages, royal 8vo. It will be edited by Dr. G. H. F. Nuttall, Lecturer in Bacteriology and Preventive Medicine in the University of Cambridge.

The first number of the Journal will appear on January 1st, 1901.

It is evident that Germany recognises the value of the veterinary sciences, and is willing to pay for developing them. This is shown by the facts that Hanover has recently erected a new set of buildings for the veterinary school at a cost of nearly 1,000,000 marks; that Saxony has provided 600,000 marks for additions to the hospitals and hygienic department of the veterinary school at Dresden, and at Leipzig the University has set aside 400,000 marks for improving its Veterinary Department.—*Journ. of Comp. Med. and Vet. Arch.*

Messrs. Mackay, Mackay, & Co., Bermondsey, have sent us one of their Veterinary Diaries.

These diaries are invaluable to the practitioner, and we most thoroughly appreciated their usefulness when we were in America during the past year.

There were numberless things which had slipped our memories, and, having no library, usually found what we wanted in Messrs. Mackay's diary. They would *sell* well in America, and they are very handsome presents to members of the profession here.

We have received Spratt's Patent Kennel Diary for 1901.

This is a most useful diary for the dog owner, and one of value also to the veterinary practitioner, as it contains a lot of useful hints about the general management of dogs. It also contains a list of the Clubs, Dog Shows, pedigree, and litter forms, and is well got up, and takes up little room in one's pocket.

CONTAGIOUS DISEASES ANIMALS ACTS, 1864 AND 1890.

SUMMARY OF RETURNS OF OUTBREAKS for the Four Weeks ending 15th December 1900.

ENGLAND AND WALES.

Swine Fever.	Glanders (including Farcy).	Rabies.	Anthrax.	Foot and Mouth Disease.	Sheep-Scab (for month of November).
Outbreaks 123 Slaughtered 1002	Outbreaks 74 Attacked 135	Dogs Attacked 1 Other Animals 1	Outbreaks 43 Attacked 60	Outbreaks 1 Attacked 17	Outbreaks 180

SCOTLAND.

Outbreaks 1 Slaughtered 1	Outbreaks 0 Attacked 2	None.	Outbreaks 16 Attacked 19	None.	Outbreaks 22

IRELAND.

Outbreaks 8 Slaughtered 154	Outbreaks 1 Attacked 1	None.	None.	None.	Outbreaks 56

Communications, Books, Journals, &c., Received.

Agricultural Journal (Cape of Good Hope); Berliner Thierärztliche Wochenschrift; La Clinica Veterinaria (Milan); Deutsche Thierärztliche Wochenschrift; Tannoform in Veterinary Medicine (March); The Sanitary Journal; Scottish Medical and Surgical Journal; Veterinary Record; La Riforma Veterinaria; Le Mois Scientifique (Paris); L'Echo Vétérinaire (Liège); Annales de Médecine Vétérinaire (Brussels); Johns Hopkins Hospital Reports; Journal of Comparative Medicine and Veterinary Archives; Recueil de Médecine Vétérinaire; Gazette Médicale de Paris; Modern Medicine; Johns Hopkins Hospital Bulletin; Il Veterinario di Campagna (Moncalieri); Le Bulletin Vétérinaire (Orleans); Revista de Medicina Veterinaria (Bucarist); La Revista Veterinaria (Buenos Aires); Zeitschrift für Fleisch-und Milchhygiene (Berlin).

The family of the late Principal Williams being unable to reply to the hundreds of kind letters of sympathy in their great bereavement, take this means of sincerely thanking the writers.